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U. T. FARMER

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OCTOBER, 1908

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THE TRAGEDY OF IGNORANCE.

It is not because of his toils that I lament for the poor: we must all toil or steal (howsoever we name our stealing), which is worse; no faithful workman finds his task a pastime. The poor is hungry and athirst; but for him also there is food and drink; he is heavy-laden and weary; but for him also the Heavens send Sleep, and of the deepest; in his smoky cribs a clear dewy heaven of Rest envelopes him, and fitful glitterings of cloud-skirted Dreams. But what I do mourn over is, that the lamp of his soul should go out; that no ray of heavenly, or even of earthly knowledge should visit him; but only in haggard darkness, like two spectres, Fear and Indignation bear him company. Alas, while the Body stands so broad and brawny, must the soul lie blinded, dwarfed, stupified, almost annihilated! Alas, was this too a Breath of God; bestowed in Heaven but on earth never to be unfolded!—That there should one Man die ignorant who had capacity for Knowledge, this I call a tragedy, were it to happen more than twenty times in the minute, as by some computations it does. The miserable fraction of Science which our united Mankind, in a wide Universe of Nescience, has acquired, why is not this, with all diligence, imparted to all?—Carlyle (Sartor Resartus.)

THE U. T. FARMER

Vol. III. OCTOBER 1908 No. 1

THE STATE FAIR.

The third fair which the state of Tennessee has held has just closed, and it was a success in every particular. The State Fair is growing with each years' experience, and from all appearances, Tennessee will in a few years hold a fair equal to the great Northern and Western fairs. Enthusiasm is running high and has spread throughout the state.

The most prominent feature was the county exhibits of farm products. The first prize was awarded Franklin; second Williamson; third Montgomery. Shelby, Knox, Maury, Rutherford and Giles counties had good exhibits. The Canadian government had an excellent display of wheat, oats, barley, potatoes, turnips, hay etc. This was to advertise the Canadian land. Some excellent specimens of corn, apples, peaches, pears, grapes and watermelons, were shown in the individual exhibits. Three good private farm exhibits were made; the first prize was awarded to the Drane and Turnley farm of Clarksville, Montgomery county.

A good display of live stock was made. The horses played a prominent part in the evening shows and the day races. Most of the horses shown were of the roadster class; excellent mules, saddle horses and ponies were shown. The best horses shown were from Tennessee. Many fine breeds of cattle were shown. Several herds of excellent cattle were shown from the Northern and Western states. A fair exhibit of hogs and sheep were on hand, and were praised much by people interested in that class of animals. The poultry in the basement of the Davidson County Building was a good display of the poultry yards of this state and one or two others. Almost every known breed of the chicken was on exhibit, several breeds of turkeys, geese, ducks, and pigeons were shown. The white chickens seemed to attract most attention.

Every kind of machinery used by the Tennessee farmer was on exhibit. The International Harvester Company led in this exhibit, that is it had the largest and best arranged exhibit. The farmer is to determine the quality. The J. I. Case Threshing Machine Company were doing some stunts with its reputable machinery. The most attractive one was to climb a forty-five per cent. incline with a traction engine, stopping it at any point on the incline and then completing the climb after a pause of a few seconds. Many Nashville firms had good exhibits on the grounds. These exhibits were of great value to the farmer, for he could

see how every type of machine worked and also see the different manufacturer's classes, and thereby select the machine best suited for his work. Many pieces of machinery were sold on the ground.

The Womans' Building contained a fine exhibit of the handy work of many industrious Tennessee women and girls. The children had a good exhibit. This early training will prepare the coming generation to compete with any state in holding fairs. Much interest was shown in the childrens' exhibit. The model dairy was quite a feature. The cows were milked by machinery, and the cream separated by the latest and best separators, butter was made and prepared for market by machinery before the eyes of the people.

The little experimental farm was not overlooked, and many compliments were passed by people interested. It showed crops of different classes under different methods of cultivation; this gave the farmer the advantage of seeing an experimental farm with his own eyes, and will tend to interest him in experimental work.

Last but not least was the side shows with their horns, drums, whistles and everything else that would make a noise, even the merry-go-round. Acrobats gave free performances in front of the grand stand during the day, fireworks furnished entertainment in the evening. The Weber band also contributed to the entertainment.

On a whole the fair was complete; it was both instructive and entertaining. The only trouble was the accommodations were too small for the crowd. The managers are considering the enlargement of the grounds and buildings. We all hope to see the next fair bigger and better than the last.—D. C. Parman '11.

THE RELATION OF MOISTURE TO PLANT FOOD SUPPLY.

There is not another matter of equal importance in increasing the productiveness of our soils and to progressive and successful agriculture in general, that is so completely disregarded as the matter of soil moisture. The amount of water in a soil and the rate of its circulation are the most important factors in determining the growth and development of plants and the art of cultivation and manuring must be based on the possible control of this moisture. Water is the most important material a plant derives from the soil for it is not only the largest constituent of the plant tissue but is also the medium which conducts the other materials to the place of their manufacture into cell structures, the leaves, and then that part of the water no longer required passes off into the air by transpiration. I feel perfectly safe in asserting that the average farmer, certainly all below the average, in our Southern country are laboring today under the impression that if the mineral plant food elements were plentiful enough in a soil, a crop of unlimited proportions might be produced. As a matter of fact we know that certain mineral

elements are absolutely necessary to a plant's development and the quantity of these in all available form limits the yield of a crop provided other conditions are right. But unless there is present in the soil, the optimum supply of moisture. the most advantageous use of these elements will not result and the productiveness of the crop will vary in proportion to the amount of water present. For plants can take up their food only in very dilute solution and besides the elements in the soil are rendered available only by the action of water upon them. In the manufacture of nitrates from the unavailable forms of nitrogen moisture must be present and green crops when turned under for soiling purposes are rendered available only when broken down and decomposed by the action of water. The actions of roots upon a smooth marble surface in the presence of moisture also shows that with moisture present they are able to set free a part of the food necessary to their growth. I believe that we have in reality but few soils that would not produce reasonably good crops if saturated sufficiently with water to unlock the mineral elements they contain and convert them into an available form. Look, for instance at the great sandy deserts of the West which by modern irrigation methods have been converted into veritable gardens. They were well supplied with plant food but not in the form which a plant must have it and it is a well known fact that commercial fertilizers when placed in the ground in dry seasons remain there unaltered and of no value to the plants unless acted upon by water.

The amount of water required can only be realized when we apprehend the large part of the plant structure that is composed of water and that even this is but a fraction of the amount required in its development. The quantity of water in the structure of plants varies from 60 to 98 per cent. of their weight and besides this during the growth period there is a constant giving off of moisture by the leaves which must be made good by the roots.

It has been determined by extended observations that almost any one of the cultured crops withdraws from the soil from 300 to 500 tons of water for each ton of dry matter produced. By careful experiments at the Wisconsin Station it has been determined that for oats, 522.4 tons of water are required for each ton of dry matter and for corn 233.9 tons for each ton of dry matter, hence in the production of a good crop of either of these an enormous quantity of water is used. Investigations with wheat also showed that 12 inches of effective rain during the growing season, starting with the soil in good condition should enable a yield of 40 bu. per acre. In Tennessee we have an average of 20 inches of rain fall during the growing season but under average conditions today a large per cent. of this is lost by surface drainage and by evaporation. In Kansas 20 in. of rainfall will produce a good crop but there the country is so much more level than ours that we can never hope to retain so large a per cent. for a crop as they can. Still we should be able to conserve much more than we do, enough even to increase the yield of a crop two or three fold.—R. M. Murphy, '11.

WHEAT AS AFFECTED BY CLIMATE.

Wheat is affected in two ways by climate. If it is planted under unfavorable climatic conditions, the yield will be small and the wheat will be of an inferior quality; that is, it is affected in (1) quantity and (2) quality.

Quantity of Wheat as Affected by Climate.

For four years the Tennessee Experiment Station planted forty-eight different varieties of wheat, and it was found that the difference in yield was very marked, varying from 27.50 bushels per acre in one variety to 37.23 bushels per acre in another. This variation shows that the climate of Tennessee is not equally suited to all varieties, for some of these that gave so mall a yield in Tennessee are in other sections heavy yielders. It is seen from this that, though a variety may be the standard in one section, if it is taken into another section it may become a very inferior yielder. It is very important, then, to know what varieties are adapted to the climate of your state and not take a variety that is reputed a heavy yielder but does the yielding in some section of different climatic conditions than your own. The Experiment Station found the Pool wheat to have the highest yield per acre, which was 37.23 bushels. The Niger, the Fulcaster and the Mediterranean were among the next yielders, giving 36.77, 36.25, and 36.18 bushels per acre respectively. These varieties are perhaps the best adapted to Tennessee.

Quality of Wheat as Affected by Climate.

The effect upon the quality of the wheat is not so easily seen as is the effect upon the quantity, but the results obtained by the Experiment Station show very plainly that the climatic conditions under which wheat is grown have much to do with the quality of the flour obtained from that wheat. In their experiments it was found that the flour from the wheat grown in 1900 and 1902 was high in protein, making it a very fine flour, while that made from wheat grown in 1901 and 1903 was low in protein and therefore of poorer quality. To prove that the climate was the cause of this, it will be noticed that the conditions in 1900 and 1902 were almost the same, 1901 and 1903 almost the same, and that 1900 and 1902 were just the opposite of 1901 and 1903. That is, the same conditions gave the same qualities and opposite conditions gave opposite qualities.

The difference in quality in those years is further explained in this way: A wheat high in starch and low in protein makes a poor flour. Since the grain gets all its starch during the ripening period, if this period is prolonged by a large amount of water in the soil and a cool

temperature, the grain will have more time to get starch and will therefore be superfluous in it and will make a poor flour. This was the condition in 1901 and 1903. A large amount of rain fell before and during the ripening period and the temperature was also rather low, both together causing a long ripening period. This caused a large percent of starch in the grain and therefore the low quality of flour obtained from the wheat grown in these years. The conditions in 1900 and 1902 were unfavorable for a large starch percentage, the ripening period being shortened by drouth and heat, thus not giving the plant enough time to fill the seed with starch. This deficiency in starch raised the percent of protein and so raised the quality of the flour.

It is seen then that the climate has a great deal to do with the quality of wheat, a rather dry, hot ripening period being the best. Since this is usually the case in Tennessee, it follows that this State is one of the best sections for wheat high in protein.

Connie Haenseler, Tyner School.

PERSONALS.

The beginning of this year finds the agricultural students located in the new Morrill Hall, their new home of which they should be and are justly proud.

All of last year's students have returned with the exception of Word, Thetford, Henders, Shofner, Rand and Jackson of the '09 class, Landess and Wilson of the '10 class.

L. R. Neel '07, has accepted a fellowship in agriculture and will be with us during this year. Many of the old students remember Mr. Neel from his reputation as a student and gentleman and welcome him back.

Practically all the old men spent their vacation on the farm making application of what they had learned and gaining experience and muscle. They return full of vigor and enthusiasm.

There are more new students enrolled in the agricultural course this year than have been in any previous year of the University's history. This indicates an increased interest in the education of our future farmers and bids fair to give us the most successful year we have ever enjoyed.

Prof. Mooers, Keffer and Quereau, attended the State Fair at Nashville last week.

The first meeting of the Agricultural Club for this year was held in the new club room in Morrill Hall Tuesday evening at 7:30 o'clock. The attendance was good, the new men were warmly welcomed, addresses were made by the old members present, and plans were discussed for making this years' work the most profitable and enjoyable ever.

AGRICULTURAL EDUCATION.

Agriculture in the High School.

III. Management of Agricultural Literature.

Nature of the Problem.

Whoever has been on the mailing list of the Agricultural Department and of the various experiment stations will know the confusion into which his tables and shelves soon come in his desire to preserve the hastily scanned tide of bulletins which come pouring in from fifty or more points of the compass.

A carefully prepared bulletin containing, as they often do, a high degree of scientific skill as well as months of patient labor in its preparation is, aside from its intrinsic merit, an object deserving of the greatest respect. But the necessity which condemns a large share of them "to be burned by the common hangman" is responsible for a bad habit which one may acquire of hardening his heart against the undiscovered merits of what may be a real treasure which unlicensed printing and the franking privilege throw at his head.

The value of agricultural bulletins has heretofore been chiefly as a means of communication between distant investigators and as a storehouse of the science. Little of the practical science is as yet in the text book form and what there is was taken mainly from bulletins. He who would have the best and cheapest information and he who would be at the forefront of agricultural progress will find it expedient to judge carefully before rejecting anything. The problem is easy for the specialist and there is no problem at all for such institutions as have ample library space for all agricultural bulletins nor for the large class who receive but have no use for any of them. But those to whom this article is specially addressed—schools with libraries whose scope is general but whose space is limited—may find it necessary to delve deeper than the title page before passing upon the value of an agricultural bulletin with anything like justice.

The point of view having been betrayed it may as well be said incidentally that every county should maintain a high school where (in addition to regular agricultural instruction) the following or some similar system of receiving, preserving and using the Farmers' Bulletins of the Department of Agriculture at Washington and the bulletins and circulars of its own state experiment station as well as the most appropriate, of neighboring states is practiced. Such literature and often well bound volumes of annual reports may be had for the mere asking. The one whose business it may be to receive and preserve in accessible form this heterogeneous mass in a form for convenient reference will need the

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experience of some one who has had to consider this problem and assuming that the reader has had little if any, the writer will proceed to set forth a plan borrowed from various sources modified to suit the needs of the case and tested by some experience.

In seeking for a basis of classification—a general law running throughout the subject—one may easily overlook the very patent fact that bulletins are fortunately all of about the same dimensions. And this physical unity is the best one to consider in arranging them on the shelf. For this purpose boxes should be provided as shown in the accompanying figures.

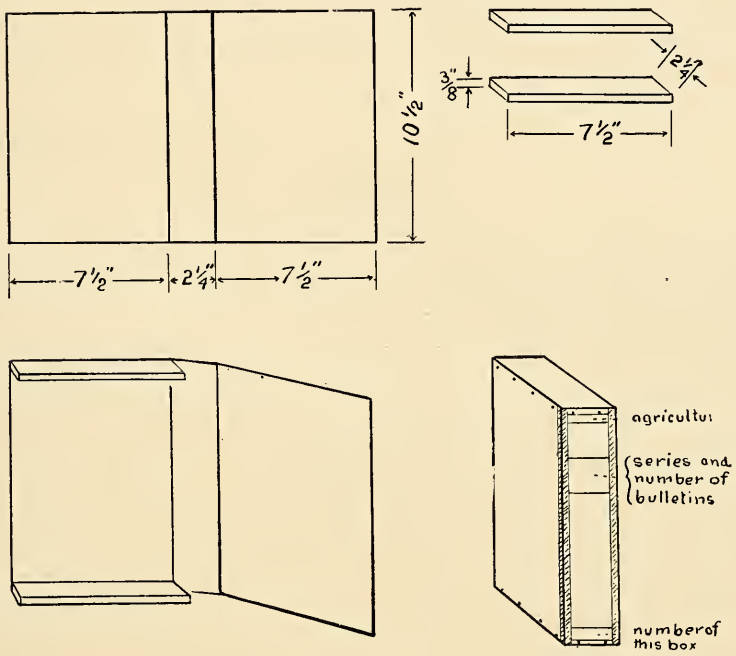


Fig 1

The Box.

The material used in making a box consists of what book binders know as No. 20 binding board which comes in sheets 26x38 inches one of which will cut four sheets of the desired size 17¼x10½ inches. As the material is very dense and tough it should be cut in the bindery where purchased. Such material should cost not to exceed 5c. per box. The top and bottom of each box consist of poplar or soft pine strips each 10½x2¼x⅜ inches planed and sandpapered. To bend the board around these strips it should be cut half through its thickness on the parallel lines 2¼ inches apart shown running across the center of each board. The board is bent with the cut side out and secured to the strips with small ⅝ inch wire nails with flat heads. The gaping wounds at the corner of the box are healed by strips of dark passe partout. Labels

for the general and serial titles may be typewritten on light weight cardboard using different shades for different series of the latter. The bottom label—the box number—is cut from a calendar page.

Such a box when completed will hold thirty-three Farmers' Bulletins three boxes holding a hundred and this size will be found a good compromise of economy, convenience, and taste. The bulletins, arranged in serial order are wrapped over sides and loose edges with a piece of manila before shoving into the box.

Mr. F. H. Broome, Secy. of the Tennessee Experiment Station, recommends for general library use a box similar, but open only at the top and with one of the upper corners cut off to expose enough of the contents to grasp for lifting out. This type does not simulate a bound volume nor protect from dust so well for use in open shelves as the one recommended but is more convenient.

Indexing.

Without some convenient and accurate means of going direct to the desired information a collection of four or five hundred agricultural bulletins would be of little value for school or practical use. The valuable fact or process may be almost as inaccessible when needed as the proverbial "needle in a haystack." This makes necessary some system of indexing and at this point a diversion will be made to discuss the subject before making recommendations.

Among the plans that have been proposed for the classification of agricultural clippings and bulletins it is quite common to see recommended a system of boxes similar to the foregoing but with subject labels such as Horses, Spraying, Foods, Dairying, Fertilizers, Veterinary, etc., pasted on the exposed back, the purpose being to put into the appropriate box all literature coming under such heads. An illustration of such system is one described in the Breeders' Gazette of Nov. 13, 1907. The limitations of this method will be apparent to one who is familiar with that kind of bulletins of which a certain one on tomatoes is typical and which is found to treat more or less of the following other subjects; soils, fertilizers, plant diseases, food, tillage, and insects. When one considers such extreme examples as "A Successful Hog and Seed Corn Farm," it is apparent that to file such bulletin in the "Hog" box is to lose it from the "Corn" and the half dozen other boxes which may have nearly as good claims to it. And when one considers those special Farmers' Bulletins which periodically appear in the series containing synopses of experiment station work gleaned from a dozen states on as many or more distinct topics the insufficiency is all the more striking. To be consistent one must have duplicates in a number of different boxes. Therefore while the simplicity of the system may recommend it

for farmers' use high schools and college students should adopt a more perfect one for their more exacting demands.

Since therefore bulletins cannot be grouped topically the only systematic plan is to group them serially with a separate index of some kind under the appropriate division of which any bulletin may be recorded by its title and serial number as many times as it includes distinct topics. This brings up for consideration the system of classifying the general subject Agriculture into its constituent departments or subheads.

The Dewey decimal system of library classification contains under the general heading 600 (useful Arts) the sub-heads 630 Agriculture which has been still further expanded agreeable to the Dewey plan. But while this system includes a separate index it has inherent peculiarities which unfit it for our use. Among these is its plan of shelving literature in an order agreeable to subject matter which is open to the same objection as the box labeling system. While it is never used for indexing bulletins even in general libraries where the Dewey system prevails yet the contents of many bound volumes of annual reports or association meetings including a great variety of the best scientific papers are hopelessly lost while the book has one fixed position on the shelf corresponding to the single label on its back. Much might also be said about the inconsistency of a system which must provide for such subjects as Cement, Mortar and Concrete; Industrial Alcohol; Tuberculosis; The Gypsy Moth; the Lawn; etc.—all recent bulletins—under the agricultural head when there are distinct subject heads for each provided in other unrelated departments of that system. In fact the difficulty is too deep seated to permit a scientific classification on purely theoretical grounds of a living subject in process of evolution and the very apparent tendency of the literature is to unfit it more and more for such classification, as agriculture is not simply a science or a useful art but a mode of life that does not lend itself to such arbitrary dissection.

A system of classification of agricultural literature has been developed in the Office of Experiment Stations under conditions favorable to the present and prospective needs of agriculture. This office has been compelled for the past twenty years to consider for its own uses just the problem here discussed, and the result is a decimal system of classification under thirteen heads instead of the nine which the Dewey system requires. The system is used in all public libraries where bulletins are preserved. A key to the system is issued as circular No. 23 Office of Experiment Stations. The accompanying key is condensed to about one-sixth the original length in which form the writer uses and recommends it for high schools. The changes from the original consist of substitution of "Agricultural Education" for "12, Statistics of the Stations" and the development of "13, Miscellaneous" into "Agricultural Economics," the omission of all fractional subdivisions under all integral headings excepting Nos. 5, 6, and 7 and a general abbreviation

Condensed Key to Index of Agricultural Bulletins and Circulars.

		Pages of Space
1.	**General Sciences**	1
2.	**Air and Water**; purity	1
3.	**Soils**: composition, classification, tillage, improvement	4
4.	**Fertilizers**; sources, composition, use, experiments	7
5.01	**Plants**; physiology, general, medicinal, improvement	2
.14	**Field Crops: Commercial**; cereals, fibers, sugar, tobacco	8
.18	**Secondary**; grass, hay, forage, silage catch	6
.21	**Horticulture**; vegetables, melons	7
.22	**Fruit**, nuts	7
.26	**Flowers**; greenhouses, landscape	2
.3	**Forestry**	2
.4	**Seeds**	5
.5	**Weeds**	2
.6	**Diseases**; remedies	5
6.1	**Foods**; composition, nutritive value	8
.3	**Preparation**, use, accessories, beverages, adulteration	5
.7	**Preservation**	4
7.1	**Animals**; physiology, general, wild, improvement	2
.3	**Production**; stock, fowls, fish, invertebrates, rations	11
.4	**Diseases**; veterinary	4
8.	**Entomology**; beneficial, injurious, repression	7
9.	**Dairying**; milk and its products	4
10.	**Technology**; manufacturing (not farm processes)	2
11.	**Agricultural Engineering**; materials, fuel, power, irrigation, drainage, implements, devices, roads, bridges, fences, buildings	6
12.	**Agricultural Education**; courses, methods, equipment	3
13.	**Economics**; general statistics, rural, home, hygienic, social, comparative agriculture	4

of the latter. Necessarily in abbreviating many fractions were dropped, their subject heads being thrown back into the next preceding number. Thus 5.22, as shown here includes all included under 5.22, 5.23, 5.24, and 5.25, of the complete system. In deciding on the elimination of certain numbers and the incorporation of their contents under other numbers the following rules were regarded: only adjacent groups were combined; only closely related subjects were combined; the amount of literature on a subject partly determined the practicability of combining it with another—the less the amount the better the reason for combining. In a few cases a careful consideration of all the literature showed the necessity of interpolating in a few cases as 5.01 and 5.18 which do not appear in the original system. With these alterations the original was preserved, so that familiarity with one is of value in using either.

In application of the system the bulletin or other unindexed pamphlet, is scanned and on the front cover are written Arabic numerals corresponding to such of the twenty-six topics of the key as are found treated inside. Thus Farmer's Bulletin 129 "Sweet Potatoes" should be labeled 5.21. 5.6. 6.1. 6.3 and 8. because in addition to its title it treats of plant diseases. nutritive value. preparation and use. and injurious insects.

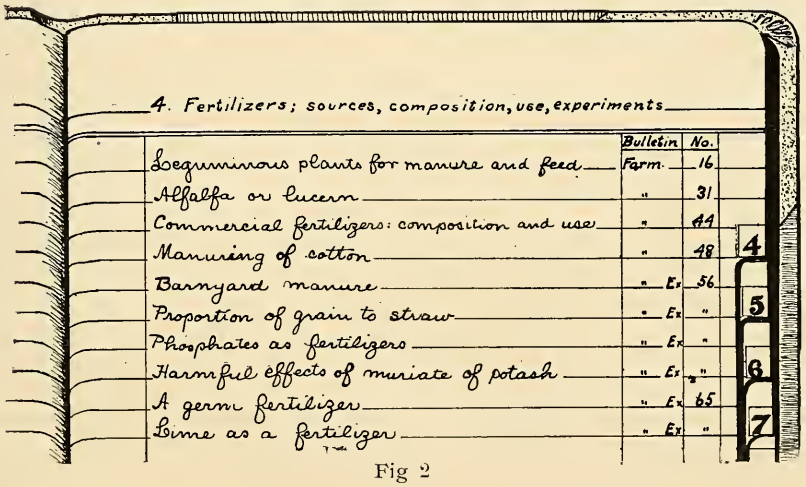

4. Fertilizers; sources, composition, use, experiments
Bulletin No.
Leguminous plants for manure and feed Farm. 16
Alfalfa or lucern " 31
Commercial fertilizers: composition and use " 44
Manuring of cotton " 48
Barnyard manure " Ex. 56
Proportion of grain to straw " Ex. "
Phosphates as fertilizers " Ex. "
Harmful effects of muriate of potash " Ex. "
A germ fertilizer " Ex. 65
Lime as a fertilizer " Ex. "
4
5
6
7

Fig 2

The index shown in Fig. 2 is made of a well bound blank book $7\frac{1}{2}$ x $9\frac{1}{2}$ inches, containing 120 pages with 25 lines to the page and with the twenty-six subject headings so entered as to divide the contents into as many parts, each proportional in space to the number of entries that are to be made under it. Then taking the bulletins in serial order enter each title and serial number under all the subject headings treated in it as indicated on the cover. A sample page of the index is shown which also shows the numerical marginal labels. With the accompanying key pasted inside the front cover, on opening the index both the key and the marginal labels will be exposed to view. It will be noted

that only integers are shown on the marginal thumb labels, such mixed numerals as 5.21 coming between the 5 and 6 labels. This gives 13 marginal numbers though there are 26 subdivisions of the index. Fig 2 shows how to cut the leaf margins and where to paste the numerals which are cut from a calendar leaf.

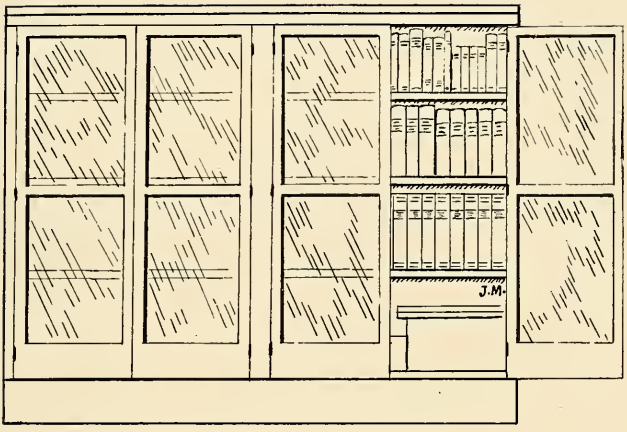
Owing to the overlapping of such subjects as "field crops" and "horticulture" it may be necessary to index the same matter under two subject headings. In case of doubt a safe rule for the inexperienced is to make the entry under the several probable headings.

A pigeon hole card index system has been used by the writer and while more elastic than the blank book method is, on the whole, decidedly less desirable provided the book index be sufficiently large and the space equitably apportioned under the several heads. Experience has shown that the book described is ample for the purpose if it be apportioned as indicated on the right hand margin of the key. This apportionment is based on the first 300 numbers of the Farmers' Bulletins. After one series of bulletins has been indexed down to some convenient recent date others in turn are entered until every pamphlet considered worth the space is recorded and boxed.

The Case.

Having been properly indexed and boxed a home for this literature is next to be provided. The accompanying illustration (Fig. 3) shows a case sufficient for the agricultural library and museum. It can be made of pine without doors for 9 or 10 dollars and of oak for about 11 dollars. Doors as shown with glass panels double the cost. The writer has had materials for such a case made at a planing mill without mortising and with tongue and groove (ceiling) back and shipped to destination where it is easily set up and stained with a dull walnut stain by pupils of a little manuel skill.

This case provides ample room for the boxes on one shelf leaving the bottom shelf for an agricultural museum of minerals, soils, fertilizers, feeds, seeds, herbarium, and insects. The top shelf is for the accompanying list of recommended agricultural reference books and the second shelf for yearbooks and reports. The index to the bulletins should be kept in the shelf with them and contain a record of all the literature on that shelf. Bound volumes having indexes should not be indexed in this system.



Case complete with doors

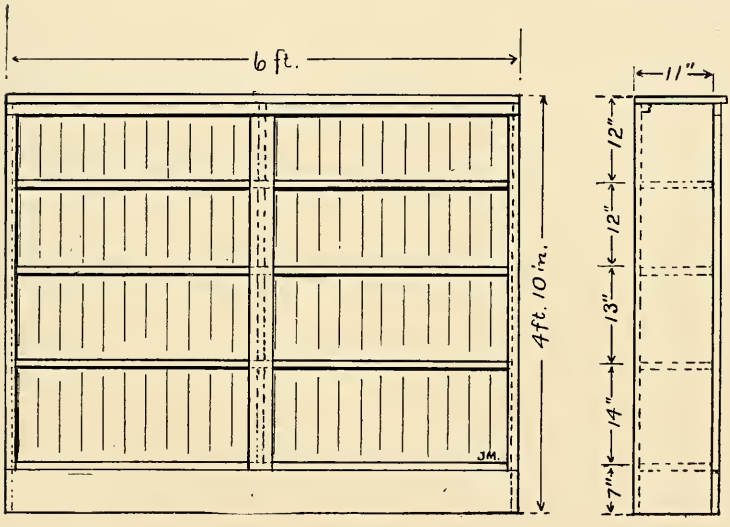


Fig 3

Assignments on agricultural topics may be made by the teacher and the index should enable the pupils to find the latest and most practical information on the subject. Whatever such a collection properly indexed may lack of being a complete encyclopedia of agricultural science and practice is a defect that time will speedily make good. A blank card should be inserted in each box on which to record names and dates of loan and return.

Text and reference books in agriculture and related sciences suitable for high school library.

Elementary Agriculture.

Soule, A. M. and Turpin, E. L.—"Agriculture, its Fundamental Principles." (B. F. Johnson Pub. Co., Richmond, 320 pages, $.75.)

Davis, C. W.—"Rural School Agriculture." (Orange Judd Co., N. Y., 267 pages, $1.00.)

High School Agriculture.

Stevenson, W. H. and Schaub, I. O.—"Soil Physics Laboratory Guide." (Orange Judd Co., N. Y., 100 pages, $.50.)

Vivian, A.—"First Principles of Soil Fertility." (Orange Judd Co., N. Y., 265 pages, $1.00.)

Smith, H. R.—"Profitable Feeding." (University Pub. Co., Lincoln, 413 pages, $1.50.)

Craig, J. A.—"Judging Live Stock." (Published by the author, Des Moines, 187 pages, $1.50.)

Van Norman, H. E.—"First Lessons in Dairying." (Orange Judd Co., N. Y., 95 pages, $.50.)

Conn, W. H.—"Bacteria, Yeasts, and Molds in the Home." (Ginn and Co., Boston, 293 pages, $1.00.)

Spillman, W. T.—"Farm Grasses of the United States." (Orange Judd Co., N. Y., 250 pages, $1.00.)

Hunt, T. F.—"Cereals in America." (Orange Judd Co., N. Y., 421 pages, $1.75.)

Hunt, T. F.—"Forage and Fibre Crops in America." (Orange Judd Co., N. Y., 428 pages, $1.75.)

Advanced Agriculture.

King, F. H.—"Physics of Agriculture." (Published by the author, Madison, 604 pages, $1.75.)

King, F. H.—"The Soil." (Macmillan and Co., N. Y., 303 pages, $.75.)

Bailey, L. H.—"Horticulturist's Rule Book." (Macmillan and Co., 312 pages, $.75.)

Bailey, L. H.—"Nursery Book." (Macmillan and Co., N. Y., 365 pages, $1.00.)

Bailey, L. H.—"Pruning Book." (Macmillan and Co., N. Y., 545 pages, $1.50.)

Sanderson, E. D.—"Insects Injurious to Staple Crops." (J. Wiley & Sons, N. Y., 295 pages, $1.50.)

Plumb, C. S.—"Types and Breeds of Farm Animals." (Ginn and Co., Boston, 563 pages, $2.00.)

Davenport, E.—"Principles of Breeding." (Ginn and Co., Boston, 727 pages, $2.50.)

General Science.

Tarr, R. S.—"New Physical Geography." (Macmillan and Co., N. Y., 457 pages, $1.00.)

Davis, W. M.—"Elementary Physical Geography." (Ginn and Co., Boston, 401 pages, $1.25.)

Leavitt, R. G.—"Outlines of Botany." with Gray's Flora. (American Book Co., Cincinnati, 791 pages, $1.80.)

Osterhout, W. T. V.—"Experiments with Plants." (Macmillan and Co., N. Y., 492 pages, $1.25.)

Bergen, T. Y.—"Foundations of Botany." (Ginn and Co., Boston, 412 pages, $1.20.)

Gray, Asa—"Manual of Botany." New Edition. (American Book Co., Cincinnati, 926 pages, $2.25.)

Herrick, G. W.—"Text Book of General Zoology." (American Book Co., Cincinnati, 386 pages, $1.20.)

Herrick, G. W.—"Laboratory Exercises in General Zoology." (American Book Co., Cincinnati, 110 pages, $.60.)

Eddy, W. H.—"General Physiology and Anatomy." (American Book Co., Cincinnati, 521 pages, $1.20.)

Eddy, W. H.—"Experimental Physiology and Anatomy." (American Book Co., 112 pages, $.60.)

Snyder, H.—"Chemistry of Plant and Animal Life." (Macmillan and Co., N. Y., 406 pages, $1.25.)

Remsen, Ira—"College Chemistry." (Henry Holt and Co., N. Y., 689 pages, $2.00.)

Industrial Pedagogics.

Kern, O. T.—"Among Country Schools." (Ginn and Co., 366 pages, $1.25.)

"U. T. Farmer."—University of Tennessee, Knoxville. Monthly, 50 cents a year.

Farmers Bulletins.

In addition to the complete set duplicate copies of the following Farmers' Bulletins for class use should be provided space in the library: Nos. 22, 34, 42, 47, 51, 55, 63, 66, 71, 86, 95, 106, 112, 121, 126, 127, 132, 134, 147, 154, 155, 157, 161, 179, 181, 183, 185, 187, 192, 195, 203, 213, 235, 245, 247, 253, 255, 256, 260, 266, 270, 278, 287.

EDITORIAL.

At the beginning of this third year of publication we desire to make a declaration of principles to our new subscribers and advertising patrons. "The University of Tennessee Farmer" is a monthly magazine issued each of the nine months of the university year beginning with the October number and closing with the June number. It is published by the Agricultural Club, a student association of the University of Tennessee. It seeks to promote scientific agriculture and agricultural education throughout the State and its purposes are not to be compared to the ordinary college paper's. The contributions to this journal are never of the light or frivolous nature that characterize many college publications, being free from levity, anecdotes, or any form of personalities other than news of students, faculty, alumni, visitors and patrons, as the examination of any number will show. The articles published are on scientific and practical subjects formulated in serious and dignified language and are contributed mainly by members of the student body, faculty and Experiment Station staff. Outside communications of similar character are always given space. We would represent that the magazine has a publication of 500 or more copies monthly, that it is admitted as second-class mail at the Knoxville postoffice and is sent into every county in the State of Tennessee; that it is well received and has a growing circulation and we believe has an increasing influence, both in the intrinsic value of its contributions and in carrying knowledge of the State University to all parts of the State, especially by its circulation among the most progressive school men of the State, and its future prospects are bright. We would also represent that its publication at the price now asked, 50c per annum, is less that the expense of printing it and that the resulting financial shortage is partly made up from the sale of advertising space to which purpose such income is always applied and the balance, amounting during its two years' publication to more than $150, is carried by friends of the movement; that the advertising pages are regarded of value to our subscribers as a directory of business, especially in those forms of merchandise which pertain to agricultural and educational equipment. We would further represent that no member of the Agricultural Club of the U. T. staff or members of the University faculty or contributors, are paid anything or receive any personal profit whatsoever for contributions or other service for this magazine, and that their interest in its success is identical with the interest of every other person who is a friend of the cause for which it stands and of the University.

We are glad to publish in this issue a short review of one of the Station Bulletins by a High School boy. We not only wish to show our appreciation of the work done by his teacher, V. S. Bright, an old U. of T. man, but we wish to encourage other pupils to follow the example of this one. We hope that some may be able to send us results of experiments they have themselves carried through.

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THE MIND IS THE MAN.

Socrates. Hold, now, with whom do you at present converse? Is it not with me?—Alcibiades. Yes.

Socr. And I also with you?—Alcib. Yes.

Socr. It is Socrates then who speaks?—Alcib. Assuredly.

Socr. And Alcibiades who listens?—Alcib. Yes.

Socr. Is it not with language that Socrates speaks?—Alcib. What now? Of course.

Socr. To converse, and use language, are not these then the same?—Alcib. The very same.

Socr. But he who uses a thing and the thing used,—are these not different?—Alcib. What do you mean?

Socr. A currier, does not he use a cutting knife, and other instruments?—Alcib. Yes.

Socr. And the man who uses the cutting knife, is he different from the instrument he uses?—Alcib. Most certainly.

Socr. In like manner, the lyrist, is he not different from the lyre he plays on?—Alcib. Undoubtedly.

Socr. This then was what I asked you just now,—does not he who uses a thing seem to you always different from the thing used?—Alcib. Very different.

Socr. But the currier, does he cut with his instrument alone, or also with his hands?—Alcib. Also with his hands.

Socr. He then uses his hands?—Alcib. Yes.

Socr. And in his work he uses also his eyes?—Alcib. Yes.

Socr. We are agreed, then, that he who uses a thing, and the thing used are different?—Alcib. We are.

Socr. The currier and the lyrist are, therefore, different from the hands and the eyes with which they work?—Alcib. So it seems.

Socr. Now, then, does not a man use his whole body?—Alcib. Unquestionably.

Socr. But we are agreed that he who uses, and that which is used are different?—Alcib. Yes.

Socr. A man is therefore different from his body?—Alcib. So I think.

Socr. What then is the man?—Alcib. I cannot say.

Socr. You can at least say that the man is that which uses the body?—Alcib. True.

Socr. Now, does anything use the body but the mind?—Alcib. Nothing.

Socr. The mind is, therefore, the man?—Alcib. The mind alone.

THE U. T. FARMER

Vol. III. NOVEMBER, 1908 No. 2

DEVELOPMENT OF THE PLOW.

The plow is perhaps the most important implement in agriculture, and for this reason we should know its history. The time of its invention is not exactly known, but it was in use at a very early period. Mention is made of it in the old Mosaic writings, as early as B. C. 1451, and the figures on ancient monuments indicate that it was in common use in Assyria and Egypt.

At first the plow was simply a crooked stick or branch of a tree, with a sharp projecting point. This crude object with very slight modifications was used for a long time, and even now in India and Morocco the form is almost the same as it was then. It is only in recent times that England and the United States have laid aside these old forms for something better. In tracing the development of the different types we find the Greeks had some marked improvements over the stick, and perhaps the most important of these was the use of wheels. The Romans even surpassed them, for they learned much concerning the preparation of the soil for crops. They even used mold boards on some of their plows, as well as wheels. One old Roman made plows with shares having high and sharp tops for cutting the soil, an improvement which is sometimes credited to modern invention. Coming on down the line of development we find Britain enacting certain laws respecting the plows and method of plowing; and right there they seem to have hit upon quite a good idea, for a man had to know how to make a plow before trying to manage or use one. The lines were made of willow twigs by the plowman, and at one time only oxen could be used. The Saxon, however, showed his barbarism by tying the horse's tail to the plow. The Saxon and Norman plows both had wheels, but they did not do very efficient work as one man was required to go along and break the clods with a hatchet-like apparatus. Referring to the Egyptian again we find their plows drawn by men and women, but later on they began the use of oxen. In regard to the use of oxen, some of the best civilized people still continue to use them, and for steadiness and particular plowing, they are as good if not better than horses.

With all of these changes there was no plow which approached the modern plow till the close of the 17th century, when the Dutch made their improvement. The model was taken from Holland to England in

1730, where under the direction of Walter Blythe, of Rotterdam, a plow was gotten out which has been in use till a recent period. This plow, which was nearly all wood, was improved on thirty years later by James Small of Scotland, who invented the cast iron "mold-board." Our modern plows are so made that they are self-sharpening, and this is due to a change made in 1803, whereby the under side of the share was case hardened, which allowed the top to wear away.

With reference to the subsoil plow, a man tried to get one out about 1675, but it was anything but a success. We find the Colonists in this country using the bull-tongue plow mainly, and much trouble was experienced in handling them. The first swivel plow was invented by Randolph in Virginia, and it still continues to be one of the best plows on the market. This plow is familiarly known as the hill-side plow, and for a long time its use was confined to the hill sides, for with this tool all the furrows could be thrown down hill. In recent years improvements have been made on this plow, and they are now used on level ground. By their use the dead furrow generally left in the center of the field is done away with as are the ridges left in the center. An additional advantage from this hill-side plow is that of having the plowed portion of the field kept together in one land. But to return to the development of the plow; in 1797 Charles Newbold obtained a patent for a cast iron plow. Then many other changes followed, and in 1805 a style of plow was made with a steel-edge wrought-iron share and the land slide and mold board each of cast iron. Notwithstanding all these energetic inventors, the introduction of the modern plow was rather slow, owing to the fact that the plow, when new, had very rough surfaces, and the people were a bit reluctant about trying anything new.

At the present time plows are made for a large number of special purposes, and each maker or manufacturer claims his plow is way yonder the best. In some plows the point is made with the plow, and in others it is detachable. The sod plow requires a coulter, either knife-like or disc-shaped, to cut the turf and thus lessen the draft. This coulter has been a great addition to modern farming, since it only came into use about the latter part of the 16th century. The manufacturers are able to give the buyer either the right or left hand plow, though the right hand is generally preferred. The modern plows range between the sod plow, with the long mold board, and the stubble plow, with the short, wide mold board.

The subsoil plow, which is also of rather recent invention, is intended for use in heavy ground for loosening the soil below the depth of the ordinary plow. This subsoil plow has neither the mold board nor share, and generally follows the ordinary plow. Some wise mind conceived the idea of combining both plows into one, and thus we find the trench plow on the market. The heavy draft has been a serious drawback to this type, so it has generally been superseded by our jointer attachment

which is really a good addition. While there are a great number of special plows these days, still we should not fail to notice the two most important, which are perhaps the Gang and the Sulky. The Sulky is used quite freely these days, but there can hardly be any very decided advantage, though the labor of the plowman may be lightened. Some writers agree that the draft is lessened very perceptibly, but there is still some doubt as to this fact. The necessary qualities of a first class plow are strength, light weight, easy draft, correct form, and above all good workmanship. Many efforts, and some successful ones, have been made to use steam as the motive power of the plow; yet the expense and inconvenience of using it in a small field has practically held it back, though it can be used profitably in some parts of the west, where there are large, level fields.

This development from a crooked stick to a gang plow, has been a very marvelous change, and, after tracing it, we should stand in a better position to appreciate our modern plows.—J. F. Farrow, '10.

ITALIAN COLLEGES OF AGRICULTURE.

Professor Craig Interviewed

Countryman readers will remember that we noted the departure of Professor and Mrs. Craig for Europe at the beginning of last semester. We are now pleased to record the return of the professor and family early in September. Although the first part of the holiday was marred by illness, the latter portion was enjoyed to the fullest extent. A representative of the Countryman secured the following interview with Professor Craig which we hope will interest our readers.

Where did you spend most of your time?

"Our time was divided something like this: Two months in Switzerland where I investigated hospital life as pleasantly as possible; two months in Italy, sight-seeing and visiting colleges of agriculture; two months in Germany, summering in the Black Forest region and visiting the horticultural schools of the Empire; and about a month divided between England, France and the low countries. The last month, I must confess, was occupied in sight-seeing after the most approved American plan—a plan I can heartily condemn."

Will you give me any impressions you formed regarding the scope and character of the Italian Colleges of Agriculture for we have heard very little about these institutions?

"I was fortunate in being able to secure satisfactory letters of introduction to the Directors of the five agricultural institutions of learning, ranking as colleges in Italy. I may say in passing that the same freedom of admission to public institutions in Europe does not exist as in America, and in Italy they are especially punctilious. I should also add that the properly introduced visitor is warmly welcomed and treated with the most courtesy.

"These five colleges are located respectively at Portici, near Naples, in fact at the foot of Mt. Vesuvius; at Perugia between Rome and Florence; at Pisa; at Bologna; and at Milan. Two of them are directed by the State Department of Public Instruction which also directs the universities, and three by the Department of Agriculture. Just why this arrangement, is wrapped up in the early history of the founding of the colleges."

Did you visit all of these institutions?

"No I was obliged to forego a visit to the Milan college which I understand is modelled largely on the lines of that at Perugia. You ask for impressions: the first that came to me was the obvious one that the government had found an excellent use for some of the old chateaux which changed political conditions and the passing of princely families and thrown upon their hand. Three out of the four college buildings were formerly princely castles and one had been a monastery. Of course their age was indefinite, a century one way or the other did not cut much figure. This does not mean, however, that they are not well preserved. They are. These walls three and four feet thick stand better than our wood or brick veneer. The evidence of medieval origin is there also in the great surrounding walls and sometimes partially masked battlements. These buildings have come into the government's hands in one way and another and some of them are now serving the admirable purpose of furthering the cause of agricultural education."

How do these colleges stand in relation to the Universities?

"I was informed that the standard for matriculation was the same as for the University. In two instances, at least as at Pisa and Bologna, they are directly affiliated with the University. At Portici, near Naples, the professors of the University in Naples lecture in the college of Agriculture. In Perugia the instruction is given without regular assistance from any allied institution."

Have these colleges lands and experimental areas as we have?

"Oh yes indeed! Bologna has twenty or thirty acres on the outskirts of the ancient city of that name. Pisa has fifty or sixty acres a mile or so from the famous leaning tower which is the center of everything popularly attractive there, while Perugia and Portici each has from two to four hundred acres under its control. Portici, by the way, has the nominal control of a former Royal park, finely wooded, once a hunting ground, now supposed to be used for forestry purposes. Unfortunately the restrictions regarding its management place it in practically the same category as the Adirondack tract in relation to Cornell."

Is the experimental station separated from the college?

"No it is an essential part of the college. The laboratory instruction in agriculture in these institutions is largely of the demonstration type. There is little real laboratory work except in Histology, Pathology, Chemistry and Physics. Nearly all the plant studies are given

by the instructor in the form of demonstrations or illustrated lectures, or excursions to the gardens and farms. Aside from the demonstration experiments, research work is being instituted to a considerable extent in the field but to a much larger degree in the laboratory. The field work in horticulture and agronomy carried on by the college at Perugia was admirable as I saw it and would compare favorably with experiment station work in this country.

What of the students?

"Well on this score one is apt to be prejudiced. You realize of course that I believe that one of the strongest assets of the agricultural community of this country is the group, or I should say army, of young men entering, in course of passage and leaving the colleges of Agriculture each year. In the first place the attendance is small as compared with ours. In no case were there, I think, more than one hundred and fifty students enrolled, usually a much smaller number. I believe that they were made up of two classes, viz., those who were sons of land holders and who wished to acquire knowledge to enable them to manage their estates, and second those who came for the purpose of qualifying as teachers of agriculture. They appeared rather less mature that the average student in Cornell.

"I will anticipate your question regarding the teachers and say that the one thing which impressed me most was their cheerful optimism. They seemed most enthusiastic teachers, sometimes under adverse conditions, with marked aptitude for imparting information and sincerely devoted to their work.

"I may also add that all of these colleges have extension departments which carry the results of research and the latest agricultural information to the people by means of district demonstration experiments and traveling lecturers.

"The best agricultural sections are responding. In the poorer parts of Italy, as elsewhere, the awakening is very slow. Nevertheless progress is making and the colleges and secondary schools of agriculture are the main springs in the movement."—The Cornell Countryman.

JAPAN CLOVER.

Japan clover was accidently introduced into this country from China or Japan, and was first observed near Charleston, S. C., about 1849. Its spread from this point, and from others, has been continuous ever since. However, its distribution during the civil war was at an increased rate, due to the fact that hay was then transported to a greater extent and was fed in the open.

Japan clover (Lespedeza striata) is an annual belonging to the order of legumes. It has a much branched and recumbent stem when standing

singly, but is erect and not so extensively branched when the plants stand close together. The plant reaches a height varying from a few inches to 2.5 feet, depending largely upon the thickness of the stand and the fertility of the soil. The flowers are purple and appear in the axils of the leaves. Japan clove blooms and the seeds are formed in the latter part of summer and in the early autumn, the exact time varying for the climate and to a less extent for the season.

Below are the results of chemical analyses made of Japan clover at the Mississippi Agricultural Experiment Station and by the United States Department of Agriculture in Alabama:

	Water Per cent	Crude Protein Per cent	Fat Per cent	Nitrogen free extract Per cent	Crude Fiber Per cent	Ash Per cent
Mississippi	13.99	12.62	2.64	40.76	24.44	5.55
Alabama	9.13	13.70	3.99	47.52	21.55	4.11
Timothy	14.2	5.7	3.0	44.6	28.1	4.4
Orchard grass	9.9	8.1	2.6	41.0	32.4	6.0
Red top	8.9	7.9	1.9	47.5	28.6	5.2
Red clover	15.3	12.3	3.3	38.1	24.8	6.2

The chemical analysis of timothy, orchard grass, red top and red clover are given that the comparative value of Japan clover may be better appreciated. It will be seen that Japan clover and red clover are about on a par, while timothy does not contain half as much flesh-making material (protein) as the clovers and orchard grass and red top contain less than two-thirds as much of the same substance. And feeding tests show that Japan clover is superior to any of the hay made from grasses.

It grows successfully as far north as Kentucky and Virginia, and seems to be pushing its zone further northward. However, it is especially adapted to the South Atlantic and Gulf States.

Although Japan clover thrives best on clay soils of at least moderate fertility, it will succeed on almost any kind of soil. It possesses an unusual ability to thrive on sub-soils. This fact is especially noticeable in railroad cuts and on embankments. Moreover, wornout fields which will not successfully produce many farm crops, will grow profitable crops of Japan clover.

All kinds of farm animals eat Japan clover greedily, and thrive on it. It is excellent for fattening stock, and is good for balancing a ration afforded by blue-grass and Bermuda pastures. Like some of the true clovers, Japan clover causes horses to slobber excessively when pastured on it periodically, but is no worse than them in this respect. Too much has been made of the slobbering because the plant is comparatively new and not sufficiently appreciated.

Where the land is fertile, or moderately so, Japan clover may be successfully used for making hay. From two to three tons per acre of hay may be secured on the kind of land mentioned. The hay is of excellent quality, readily eaten by all kinds of live stock, and does not cause the slobbering that is produced, under some conditions, by the green plants. The Mississippi Agricultural Experiment Station found that for the production of milk, a ration composed of Japan clover and cottonseed was the most economical. Due to a greater appreciation of the value of Japan clover hay, the demand for it is increasing, so that better prices may be expected in the future. It should be cut for hay when about half of the lower crop of seed have matured. This prevents the loss of many leaves and at the same time provides for a re-seeding of the ground. The hay may be cocked on the same day that it is cut, after allowing it to thoroughly wilt. The hay should be allowed to stand in the cock one or two days before final storage. It should be handled carefully to prevent loss of the valuable leaves.

As a soil improver Japan clover has great value. In common with other legumes, it has the ability to use atmospheric nitrogen. Its roots usually have a growth of nodules unequalled by any other legume. Wornout fields, after growing Japan clover for a few years, are found to be greatly improved in fertility.

The common means of distributing and seeding Japan clover have been natural agencies. Since one of the plants standing alone extends by means of branching over a circle several inches in diameter, the species possesses in itself the ability to spread slowly. Washing rains distribute the seed dropped by the parent plants. However, the more important and speedy agencies of distribution are live stock. Animals eat the clover that has formed seeds, and later exerete viable seeds probably at a considerable distance from their source. Distribution of Japan clover in the way just mentioned is especially noticeable on the open range and along the public highways, and due to the interference of the free movement of live stock where there is a fence law, the clover is not so abundant nor so general. Farmers often take advantage of this natural method of seeding Japan clover by allowing stock to graze the clover that has formed seed during the day and then running them in a field in which a "set" of Lespedeza is wanted. Manure from animals that have been fed Japan clover hay may be used in seeding a field. However, if it does not suit or is impossible to adopt the methods suggested, the seed may be purchased and sowed as other clovers are. It is commonly sown in the spring after danger of frost has past. The price of a bushel of seed in the hull is from $4 to $5, and the weight is 25 pounds. This amount will seed two or three acres, although sometimes a bushel is used to the acre.

Japan clover may be used in almost any rotation in place of red clover. In the more Southern States it is often rotated with winter oats.

After the Japan clover has matured its seed (or a part of them) it is turned under and winter oats sowed. The following spring the clover will germinate, and after the oats have been removed, will make sufficient growth to afford a good cutting of hay. Pasturing the crop the summer before turning under, preparatory to sowing oats, will do no harm, for, as mentioned before, the seeds are found in the axils of the leaves and thus are distributed all over the branching, recumbent plant. So that although stock may graze the plants close, there will be some stems left to form seed.

Another very important point in favor of Japan clover is its unusual hardiness. So far it is not attacked by any serious plant disease or insect pests.

Besides the generally known Japan clover (Lespedeza striata), there are other species of Lespedeza to be found over a large part of the South. They all contribute to the value of our pastures. A broad leafed variety, tested by the North Carolina station, was found to be superior to the common form.

Like the rest of the farm plants, Japan clover has its weak and objectionable points. It is strictly a warm weather plant, beginning growth in the spring after frosts have ceased and being killed by the first frost in the autumn. For this reason there must be a rotation of pastures where Japan clover is used as a pasture crop. Not being a deep rooted plant, it is seriously affected by protracted drouth. Another objection that has been raised against Japan clover—although it has been exaggerated—should be mentioned. Under favorable conditions it will croud out Bermuda and bluegrass to a varying extent. Sometimes this may be a desirable trait, but at other times an objectionable one. Where the land can be cultivated, it is easy to get rid of Japan clover, if such is really desirable, by plowing the land after the plants have started and before they have formed seed. Consequently there is no trouble whatever with Japan clover in cultivated land.

In reiterating some of the most important aspects of Japan clover in the South discussed in this article, three are taken up. First, its unusual ability to adapt itself to a new home and its constant association with the nitrogen gathering bacteria, should be emphasized. Some legumes must be grown for a season or more or artificially inoculated before they will thrive on a farm where they are being introduced, due to the lack of the bacteria being associated with thin roots. But Japan clover, under the present methods of distribution, at least, seems to be always associated with the bacteria that cause such an abundant nodular growth on its roots. Second, it has been mentioned before, and should be emphasized, that Japan clover furnishes pasture for the warm season only. So, where it is desirable to use it as a pasture crop, it should be supplemented during the late fall, winter and early spring by some other forage crop. Bluegrass, burr clover, rye, barley and winter

legumes are good for filling up the gap between crops of Japan clover. Third, it is under the present conditions existing generally in the South, that Japan clover is a plant of so great importance. When the farming becomes more intensive, the methods more thorough and the soil more fertile, Japan clover may not occupy an important place in Southern farm economy, but while this transformation of conditions is taking place it will be a most valuable aid in bringing about these very changes, and, at the same time, in adding to the value of farm products. It is its ability to grow on almost any kind of soil, to germinate and grow in an imperfect seed bed, and at the same time to produce a valuable pasture and to enrich the soil that gives Japan clover a place of pre-eminence on the infertile and extensively farmed lands of the South.—L. R. Neel, '07, in Southern Agriculturist.

You must make account, to leese almost Twenty yeeres Profit, and expect your Recompence, in the end. For the principall Thing, that hath beene the Destruction of most Plantations, hath beene the Base, and Hastie drawing of Profit, in the first yeeres. It is true, Speedie Profit is not to be neglected, as farre as may stand, with the Good of the Plantation, but no further. * * * * * Wheat, Barley, and Oats, they aske too much Labour: But with Pease, and Beanes, you may begin; Both because they aske lesse Labour, and because they serve for Meat, as well as for Bread.—Sir Francis Bacon. (1560-1626).

AGRICULTURAL EDUCATION.

Agriculture in the High School.

II. Course of Study.

The amount of work suggested here is pretty close to the upper limit. The amount of work the school may accomplish depends not only on how many topics are touched upon but also on what the teacher is able to make them mean. Any person of agricultural experience is well aware that it is of such a nature as to admit of neither definite apportionment in amount nor location in time. Nevertheless the aim should be high and a complete plan kept in mind in order to induce and measure progress from year to year and to properly apportion effort between subjects.

No attempt is made in this course of study to develop other topics than the agriculture and its related sciences because such other topics have been exhaustively discussed and expanded and because this is a high school manual of agriculture. Its purpose is to enable the school man to take his bearings. But it cannot at best be a substitute for technical training in agriculture on the part of the teacher. The problem is not to be solved by a formula.

Explanations:

Bul. means Farmers' Bulletin.

O. E. S. means Bulletin of the Office of Experiment Stations.

Year Book means Year Book of the Department of Agriculture.

Stat. means Bulletin of the Experiment Station of the state where the school is.

Prob. means problem.

Excurs. means excursion.

Micros. means microscope.

Lab. means laboratory.

A unit consists of 36 weeks' work with daily recitations of 40 minutes each five times per week. Two laboratory or excursion periods are equivalent to one recitation period. Value of irregular work should be estimated on this basis.

Reading assignments and text books are printed in italics.

Courses;

Preparatory and general

Literary ..... L.

Scientific ..... S.

Engineering ..... E.

Teachers ..... T.

Industrial ..... I.

Short courses in Agriculture

Groups;

	Subjects				For whom prescribed				
English	11	21	31	41	L	S	E	T	I
Foreign Language	12	22			L				
			32	42					
Sociology	13	23	33	43				T	I
Mathematics	14	24			L	S	E	T	I
			34	44			E		
Science	15	25	35-6			S	E	T	I
				45		S		T	I
Pedagogics, supplied by Co. Supt.								T	
No. units (years) prescribed					8	11	12	15+	15
No. electives					7	4	3	0	0
Required for graduation					15	15	15	15	1

Subjects by Years	SCIENCE in detail (three Periods per week)
I 11 English 12 Foreign Lang. 13 National Govm't ½ Accounts ½ 14 Algebra **15 Elementary Physics and Phys Geog**	**FALL** Mechanics of liquids, Pascal's law, capillarity. Properties and states of matter. Force: composition and resolution, moment. Specific gravity *Tarr or Davis, Phys. Geo.; Earth, Sea.* **WINTER** Mechanics of gases, Boyle's law, barometer. Heat, thermometer. Meteorology. *T. or D.; Atmosphere.* **SPRING** Structure of earth's crust, collection of minerals. Weathering, frost action. Local topography, stream action. Mechanical principles. *T. or D. Plains, Mountains, Rivers.* (excurs.)
II 21 English 22 Foreign Lang. 23 Ancient Hist. 24 Plane Geom. **25 Botany**	**FALL** Structure and function of flower. Analysis and classification. Ready recognition of 12 families. Fruits and fruiting habits. *Leavitt and Cray; Flower and Key.* **WINTER** Morphology and function of root, stem and leaf. *Leavitt.* **SPRING** Physiology: germination and nutrition. Seed structure. *Osterhout.*
III 31 English 32 Foreign Lang. 33 Civics ½ Economics ½ 34 Algebra ½ Geom. ½ **35 Biology and Invert Zoology** First half 3 periods Second half 5 periods **36 Chemistry** First half 5 periods Second half 3 periods	**FALL** Insects; structure, development. Elementary chem. " collecting and classifying by orders. lab. guide. *Snyder.* " relation to plants. *Herrick* **WINTER** Protozoa, bacteria, yeasts, fungi, Cell structure and division. *Conn, Herrick.* (micros) Chemical theory and lab. guide. Chemical processes in arts and industries. *Snyder.* **SPRING** Other invertebrate types. Parasitism. Systematic zoology. (micros.) *Herrick* Organic chemistry elementary. *Snyder*
IV 41 English 42 Foreign Lang. 43 European Hist. 44 Physics **45 Physiology and Vert. Zool.**	**FALL** Animal tissues. (micros.) Skeleton of man and of other vertebrates. Muscles of man. *Eddy.* **WINTER** Lab. dissection of rabbit, pigeon, turtle, frog, fish. Comparison of structure; musculature, digestive, circulatory, excretory and reproductive systems. Lower chordates, systematic zoology. *Herrick* **SPRING** Variation and natural selection. Brain, nerves and special sense organs. Geological and geographical distribution. *Eddy* Hygiene.

Suggestions:

Engineering prep. students may be excused from the agricultural phase of 25 and 45. Where the school provides manual training it should there be given in lieu of the agriculture.

Girls in Science course may be excused from the agricultural phase of Science course as follows: 15 spring, 25 spring, 45 fall and spring. Where the school provides domestic science work it should be taken in lieu of agriculture in those terms.

Pupils in Teachers' and Industrial courses should take as much of the manual training as their schedules will permit.

Correlated with AGRICULTURE (two double Periods per week)

Moisture control, mulches, field samples. Soil experiments in laboratory. Physical analysis and classification. Drainage methods (excurs).	*O. E. S.* 186 *Dauis; Agriculture*
Soils of state. Physiographic regions of U. S. Daily weather map. Climate and physiography as related to agriculture.	*Bul.* 266 *Year book* *Stat.*
Local soil areas, collection. Soil temperature as related to drainage, color, slope, texture, depth. Control of texture. Implements of cultivation. (excurs.)	 *Davis*
Economic representatives of 12 families of plants. Fruiting habits of plants, (useful and injurious) Seed collecting. (excurs.)	*Bul.* 86 *Gray; Botany*
Cereal judging. Crop statistics. Special articles. Budding and grafting. Propagation.	*Buls.* 134, 154, 157, 161 181, 185, 260 *O. E. S.* 186. *Year book*
Pruning and spraying. (excurs.) Seed and seed control. Viability tests. School plots. (breeding, desirable introductions)	*Buls.* 195, 218, 253, 255 *Stat.* *O E. S.* 186
Injurious insects, nature of damages. Life history, repression. Collection and preservation. (excurs.)	*Buls.* 47, 127, 132, 134 155 *Stat.*
Germ diseases of plants and animals, repression. Useful bacteria and yeasts; in arts, in agriculture, inoculation. Composition of soil and of plant foods; pot demonstrations. Composition of 50 common substances, foods, fertilizers, and reagents.	*Buls.* 192, 203, 245, 256, 278 *O. E. S.* 195
Relation of soil texture to fertility. Fertilizers and manures (probs.) collections. Plotwork in fertilizers and legumes. (through vacation) Foods and nutrition. Collections.	*Buls.* 112, 121, 247 *Vivian*
County fair, Grasses and forage, Feeding farm animals. (probs.) Swine, sheep and beef judging. (excurs.)	*Buls.* 22, 66, 71, 147 *Craig*
Farm butchering. Meat; value and location of cuts. Milk; composition and testing. Poultry. (excurs.)	*Buls.* 34, 42, 51, 55, 63 106, 179, 183, 287 *Van Norman*
Horse and dairy cattle judging. Improvement of plants and animals by selection. Mapping local farms. Farm buildings and equipment; estimates, problems, Farm management; rotation, diversification and specialization.	*Buls.* 95, 126, 187, 235, 270

Pedagogics should be provided for specially by the county superintendent to suit schedule of those taking the Teachers' course.

Subjects which may be given in alternate years are as follows:

13 and 23. 31 and 41. 33 and 43.
15 and 25. 32 and 42. 34 and 44.

This alternation reduces the number of daily recitations from 21 to 15. However it may be better to make two divisions in class 15 and class 25 keeping first year pupils to themselves. The labor of daily preparation

of materials which is necessarily great will still be saved by the alternation.

Where the school can afford but two teachers or where much is attempted in manual training and domestic science or where grammar grade subjects are carried into the high school this course may be shortened by cutting off the fourth year and omitting 32, 33 and 34. In this case 31 would be given without alternation and 45 given in a modified form in the third year for the benefit of industrial and short course students.

Where the school can afford sufficient force of teachers, alternations should be done away with and more foreign language added.

Discussion.

The column headed "**Science**" gives suggestions as to the most important topics to be developed in each science subject and in a general way suggests the order of development. However no scheme such as this can properly deprive the teacher entirely of his right to plan the work after his own (enlightened) ideas of development of his subject. The topics enumerated refer to laboratory work, lectures, and text book assignments, though the laboratory work was most in mind in the preparation. Text book work should be regularly assigned ordinarily in the order presented in the text. The text book thus can usually be made the tangible means of continuity, giving a feeling of definiteness to the student and affording a means of review of principles. The laboratory work of this column generally preceedes the corresponding subject in the "Agriculture" column and where possible is presented just preceding the season when its agricultural phase is at high tide on the farm. This seasonal succession dictates the order of presentation.

The column headed "**Agriculture**" suggests the best means of illustrating by familiar materials scientific principles which without familiar illustration would be valueless for whatever purpose. For principles are not required until they are applied nor are facts learned until they are visualized. This is the significance to the student who takes science for its 'cultural' purposes only. Conversely the column headed "Science" gives to the pupil of the Industrial course a mastery of the principles underlying his future vocation without which he is a slave to rule of thumb methods and tradition. To get the benefit of each others view point and to correct the unsymmetrical development each would get if segregated from the other it is necessary to have both groups of students in the same class and the science teacher should of course be the teacher of agriculture. Where the school provides courses in domestic science the teacher of that subject could very properly take the chemistry and assist in biology and physiology. But for general pedagogical reasons any attempt at specialization in teaching should so apportion the work

between teachers as to give the first year high school pupils as few teachers as practicable.

The **laboratory work** should all be done in one large room and recitations in science and agriculture should be conducted in the same room in the presence of the demonstration or some relic of it to condemn him who does not keep his wits about him. This plan will save much in duplication of apparatus and much more educationally in correlating and unifying all science through the agricultural medium. And this method will emphasize the fact that sciences even for cultural purposes are learned to be applied and that nature cannot be cheated into bestowing the blessing on him who falls short in this requirement. Pupils should see the setting up of each experiment and have a clear idea beforehand of what it is intended to demonstrate. All work prepared and demonstrated at the expenditure of considerable time and labor should be seen by and explained to all science pupils regardless of their classification. There should also be a special agricultural room convenient to the laboratory, suited for class use in grafting, budding, milk testing, weighing, cereal judging, etc., and storage.

Since agriculture deals with gross and variable materials the laboratory work in agriculture may easily be made more technical and exact than the occasion warrants. The teacher should remember that demonstration and not investigation is the purpose. And in the laboratory work in science a similar mistake may be made by leaving the pupil "stumped completely" by a printed laboratory guide which he is unable to translate into action. The teacher would much better have a hand in every experiment or operation than to risk a loss of interest that far outweighs the opportunity to teach the "scientific method." The teacher will accomplish much more by leading in manipulations and permitting pupils to repeat for their own satisfaction at their leisure when their delays are at their own expense.

The **daily program** may be so arranged as to bring agricultural work last on the days' program, the usual closing hour coming at the middle of the double period where the closing hour is 3 o'clock or earlier. The double period may be thus economically used for excursions and for bringing up irregular work of pupils where needed.

Certain additional **economies** in this course of study should be mentioned. It will be noticed that excursions are arranged to come in fall and spring terms when the season is more open and life more active and that agricultural literature is assigned principally to the winter term when the season induces less agricultural activity and storms and diminished daylight conduce to reading and study. It will also be noticed that the use of microscopes is prescribed so as to distribute them throughout of the three terms. Other economies to be suggested are the regular testing of milk samples and in the spring viability and purity tests of seeds at the laboratory and the weighing at the school of articles and stock marketed from or brought to the school community.

The habit of weighing, measuring and testing articles of commerce is a good one to cultivate and the establishment of stock scales at the school house may be made a means not only of studying fattening processes but of providing practice in all kinds of stock judging and of making the course more practicable for girls. And it will be the means of bringing to light the hidden genius of the stock judge, the expert guesser of weight "meek, inglorious" though he may otherwise be.

The **high school should admit** to its regular courses only those pupils who are of suitable high school age, of good mind and intentions and who have sufficient facility in reading, writing, figuring and language to carry the work without impeding their classes or unduly burdening their teachers. The principal may satisfy himself regarding these prerequisites by examination of the pupil or of his credentials. Short course students and farmers should be admitted to all agricultural work without scholarship requirements and without the correlated science work. They may prove a valuable ballast to the class and aid in preparing materials. They should be induced to qualify and enter regular courses. The division of the school year into fall, winter and spring terms makes it easy for short course students to enter for brief periods.

The **passing grade in agriculture** should be granted on attendance and performance of manual assignments and on concise notes and drawings rather than on ability to write an examination. Carefully kept note books should be insisted upon even at the expense of progress, and the expression of praise should be that "he did good work" rather than "he made good grades."

Other Subjects.

The other subjects of the high school course call for brief discussion. The inauguration of agricultural work need have no direct influence in dictating the work in the English, foreign language, mathematical or sociological groups, and what is said concerning them will, it is hoped, be correct pedagogy aside from the agricultural halo that pervades these pages.

The purpose of the **English course** is the teaching of correct expression, the mastery of a few classics and the instilling of a desire for more. Technical grammar and rhetoric are to be considered of value only in giving teacher and pupil a vocabulary for labelling different elements of structure and different forms of expression, whereby they may discuss understandingly the literature, themes and vocal expression which constitute the real subject matter of the course. As technical exercises of cultural or disciplinary value in themselves they should never be permitted to interfere with the primary purposes of the course. For such disciplinary purposes they should if used at all be placed last in the course where they will not interfere with the primary purpose; for cor-

rect expression comes most easily and most usually through practice with good written and oral models for imitation while technical grammar and rhetoric teach one to classify rather than correct his errors. Short themes and rhetoricals should be frequent and the study of classics continuous. College entrance requirements in English have been a safe foundation for the course in literature. Mythology, biography, and political and literary history aid in their interpretation and contribute greatly to interest. The reading of modern fiction should come under the direction of the teacher, while no greater or more lasting pleasure can come from the course than a sympathetic study of standard fiction. The school library should provide standard fiction and juveniles from which to regularly prescribe and loan.

Authors of high school **mathematics** have too often preferred after teaching a principle to carry it into some difficult application rather than some useful application. A difficult task should have some justification other than the pleasure of its accomplishment. Teachers who have gotten past the difficulties easily forget that there may be little pleasure in approaching the task for the first time as the pupil does. It is a well known fact that class ranks are sadly decimated during the early part of the high school course and the cause may be partly here. To demonstrate mathematical principles by the easiest methods and drill in them by a sufficient variety of easy representative problems such as appears to be the plan of a new algebra by Slaught and Lennes seems the best economy of time and effort. Physics as a fourth year subject should be quantitative with drill in measurement and a few illustrative problems for each principle involved.

Three classes by alternation covering four years' work in **foreign language**, preferably Latin, is as much as the three-teacher high school can afford. Should another teacher be added two years of modern language should be included.

The **sociological group** is intended especially for those who make the high school their finishing school, the assumption being that others will get such courses later in their studies. The ancient history will supplement the work of English and Latin classes, and the mechanical drill in book keeping and U. S. Constitution are well suited to the first part of the course. The work on the Constitution should be in connection with a review of the constitutional period of U. S. history. Citizenship and economics of the latter part of the course afford training in logic and debate and are correlated with the course in European history which affords examples of the origin and development of our present standards of economics and citizenship. The course in European History should devote special attention to the history of England.

Although **arithmetic** does not appear by name anywhere on this course of study no course devoid of agriculture could by giving arithmetic a distinct place in the course provide more valuable practice in all

applications of that subject than may be one of this kind. In the first year moisture and humus determinations and soil analysis give all applications of percentage and the half year in accounts provides business arithmetic; and those who desire may find the laws of liquids, gases, and machines rich in problems involving proportion and analysis. Plane geometry in the second year supplies mensuration in quantities sufficient for all demands while agricultural statistics form a distinct and much neglected phase of arithmetic including the making and reading of curves, and seed testing continues the use of percentage. The third year introduces a variety of the finest exercises in fertilizers involving proportion, analysis, and percentage while in the fourth year the making of rations, milk testing, and well planned farm problems in equipment, maintenance and variety of farming involve every chapter of arithmetic from weights and measures to alligation, with a chance to get more by the election of physics. Arithmetic presented in this form is vital and contributes to the agricultural work in such a way as to pay for the time and space it takes by requiring a precise knowledge of the agricultural or scientific factor involved which cannot be better emphasized and illustrated than by a problem. Moreover, considered purely as an arithmetical exercise no better medium for teaching arithmetic can be found than this where ability to understand concrete problems depends not upon the interpretation of a ready made statement of possibly unfamiliar factors which constitutes the chief difficulty of most students in arithmetic, while abstract principles of factoring, proportion, powers and roots are much more clearly introduced as presented in algebra and geometry free from the limitations peculiar to arithmetic.

Drawing, like arithmetic, should be taught regularly in connection with the Science and Agriculture and especially with the laboratory work. If the psychological moment for presenting a thing is when the student recognizes that the thing is needed, the need of drawing to express and record facts that cannot otherwise be accurately expressed justifies placing it with these subjects where the reciprocal advantage of interest and utility are secured. A plan suited to the development of the Science and Agriculture might be as follows:

I. Diagrams illustrating experiments and demonstrations. Drawing of vessels and apparatus. Perspective and shading.

II. Flowers, leaves, seeds and seedlings. Water colors. Sections of seeds and stems.

III. Insects and microscopic forms. Diagrams of invertebrate structure. Chemical apparatus.

IV. Vertebrate tissues and organs. Domestic animals. Farm buildings and devices. Lettering and map making.

That former age in which everyone thought that trades must be established by bounties and prohibitions; that manufacturers needed their materials and qualities and prices to be prescribed; and that the value of money could be determined by law; was an age which unavoidably cherished the notions that a child's mind could be made to order; that its powers were to be imparted by the school-master; that it was a receptacle into which knowledge was to be put and there built up after the teacher's ideal. In this broader era, however, we are beginning to see that there is a natural process of mental evolution which is not to be disturbed without injury; that we may not force upon the unfolding mind our artificial forms; but that Psychology, also, discloses to us a law of supply and demand, to which if we would not do harm, we must conform.

—Herbert Spencer.

THE QUERY PAGE.

Questions of general interest from farmers, teachers, students and all persons interested in the development of Scientific Agriculture are solicited. Any question not considered of general interest will be answered by private letter. Address all communications to the U. T. Farmer.

This page is a new feature of the Farmer, and is in the experimental stage. If the people show an interest in this attempt it will be made permanent in the future. We intend to make the Farmer a literary medium between the University students and the farmers and teachers of the state. We are all working for one great cause, and the Farmer staff is trying to unite all efforts through these columns.

If you have an idea send it to us and let it be published or at least considered in the attempt to unite the efforts to establish higher standards of agricultural products. If you are in doubt get the advice of your colleague. We believe that advice is worth what you pay for it, but you will find that you will be well paid for your effort if you do your part in making this page a permanent feature of the Farmer. Don't wait to see what the other fellow will do, but take hold and do for yourself what you think best. What would you do for something to eat, if every farmer would wait to see what the other man was going to do? If you want to get our advice on any subject, drop your question in.

All questions will be answered by students or members of the faculty. The answers will be concise and to the point. All answers will be based on actual experiments when possible, otherwise we will give our opinion and say that it is merely a suggestion based on facts. We especially solicit questions from the farmers concerning their interests, such as the spraying of orchards, cultivation of crops, crop rotation, etc.

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FARMING.

The glory of the farmer is that, in the division of labor, it is his part to create. All trade rests at last on his primitive activity. He stands close to nature; he obtains from the earth the bread and the meat. The food which was not, he causes to be. The first farmer was the first man, and all historic nobility rests on possession and use of land.

Men do not like hard work, but every man has an exceptional respect for tillage, and a feeling that this is the original calling of the race—that he himself is only excused from it by some circumstance which made him delegate it for a time to other hands. If he have not some skill which recommends him to the farmer, some product for which the farmer will give him corn, he must himself return to his due place among the planters. And the profession has in all eyes its ancient charm, as standing nearest to God, the first cause.

Nature never hurries; atom by atom, little by little she achieves her work. The lesson one learns in fishing, yatching, hunting, or planting, is the manners of Nature—patience with the delays of wind and sun, delays of the seasons, bad weather, excess or lack of water, patience with the slowness of our feet, with the parsimony of our strength, and with the largeness of sea and land we must traverse. The farmer times himself to Nature, and acquires that lifelong patience which belongs to her.

We cannot enumerate the incidents and agents of the farm without reverting to their influence on the farmer. He carries out the cumulative preparation of means to their last effect. The crust of soil which ages have refined he refines again for the feeding of a civil and instructed people. The great elements with which he deals cannot leave him unaffected, or unconscious of his ministry; but their influence somewhat resembles that which the same Nature has on the child—of subduing and silencing him.

We see the farmer with pleasure and respect when we think what powers and utilities are so meekly worn. He knows every secret of labor; he changes the face of the landscape. Put him on a new planet and he would know where to begin; yet there is no arrogance in his bearing, but a perfect gentleness. The farmer stands well on the world. Plain in manners as in dress, he would not shine in palaces; he is absolutely unknown and inadmissable therein; living or dying, he shall never be heard of in them; yet the drawing room heroes put down beside him would shrivel in his presence—he, solid and unexpressive; they, expressed in gold-leaf. But he stands well on the world—as Adam did, as an Indian does, as Homer's heroes, Agamemnon, or Achilles do. He is a person whom a poet of any clime would appreciate as being really a piece of old Nature, comparable to sun and moon, rainbow and flood; because he is, as all natural persons are, representative of Nature as much as these. [Emerson.]

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THE U. T. FARMER

Vol. III. DECEMBER, 1908 No. 3

PLAIN FACTS ABOUT THE HOOK WORM DISEASE.

Under the above title the Southern Farm Gazette prints an article prepared by Dr. H. F. Harris, Secretary of the Georgia State Board of health, fully describing the disease caused by the little worm *Uncinaria Americana*. The article is so concise and to the point that we copy in full.

A little crawling thing about the bigness of a piece of thread not half long enough to twist round a man's finger.

Under the eye of the microscope it jumps into a sinuous, graceful, eel-like creature, wriggling and squirming and exhibiting energy and ambition out of all proportion to its size.

It is not a bit spectacular, and it doesn't get itself discussed in legislative halls, or furiously debated in political campaigns. Modest and unassuming, it does not aspire to such dignity.

The Colossal Burden.

It is satisfied simply with (1) lowering the working efficiency and the pleasure of living of something like 200,000 people in Georgia, and all other Southern States in like proportion; with (2) amassing a death rate higher than tuberculosis, pneumonia, or typhoid fever; with (3) complicating the labor problem in the Southern States; with (4) stubbornly and quite effectually retarding the agricultural and industrial development of the section; with (5) nullifying the benefits of hundreds of thousands of dollars spent on education; and with (6) costing the South, estimated, in the course of several decades several hundred millions of dollars.

More serious and closer at hand than the tariff; more costly, threatening and tangible than the negro question, making the menace of the boll weevil laughable in comparison, it is preeminently the problem of the South.

A few cents' worth of drugs and good, strong shoes wisely distributed will banish it, absolutely solve its many details, in six months. After that, other more thorough methods prevent the possibility of its recurrence.

This tragically expensive "luxury" which the people of the Georgia and other Southern States are, unknowingly playing against life, health

and progress is—the hook worm. It has a longer and more formidable name, *Uncinaria Americana*, but the other answers all purposes of classification.

The story of this sinister little parasite is intensely dramatic, since it concerns most intimately the history and the welfare and the future of the Southern people in a degree that is not recognized by one man in twenty thousand.

Our "Shiftless White" Population Not Indolent but Diseased.

It is the more pathetic, from the fact that its details explain largely the existence of that class of rural population known in the South as the "poor white," illiterate, bereft of energy, sallow of complexion, profoundly anemic—a class that thoughtful students recognize in a moment with this general description, and the condition of which many men and women are striving earnestly to improve.

They have been variously charged with thriftlessness, improvidence and lack of ambition.

Science now overturns this harsh indictment and shows that they are suffering from a genuine disease which saps their lives and makes them listless, indifferent, careless beings. It shows that they are thus paying the penalty for ignorance on their own part and on ours, an ignorance which permits them to become the victims of their own neglect and which lowers their ability to enjoy life and to participate in the tasks of industry in a degree that costs the community a toll of millions yearly.

The story is insufficiently fanciful to provoke incredulity. The very simplicity of the cause and the simplicity of the cure militate against either being taken seriously. The information upon which these statements are based is known and proved by medical authority.

Statements of the Highest Authority.

Dr. H. F. Harris, Secretary of the State Board of Health, has been, for several years, conducting a systematic and energetic crusade against hook worm disease in Georgia. He has been successful to a wonderful extent, but finds himself handicapped in the manner suggested, by the natural hesitation of people to accept so elemental an explanation and so simple a solution for a grave condition apparently very remote from the machinations of a little wriggling, snake-like worm. It is upon information supplied by Dr. Harris, upon the solicitation of this paper, that this article is based.

Dr. Harris positively diagnosed his first case of hook worm disease, or uncinarasis in Georgia in the spring of 1902. A year previous to that time the hook worm had been identified beyond doubt in Texas.

The disease has existed for an unknown length of time in many parts of Africa, in southern Europe, in Asia and other tropical and sub-

tropical latitudes. The concensus of medical opinion is that it was introduced into this country by African negroes, brought over as slaves many years, of course, prior to the civil war.

As in Georgia, and other Southern States, uncinarasis, or the "lazy sickness" baffled scientific opinion when it appeared as epidemic in Egypt and subtropical portions of Europe. At times, it carried off thousands of lives in the course of a few months. As a rule, it ran a slow, insiduous course. Workers of ordinary activity it made profoundly anemic and disinclined to exertion, rendering them acutely susceptible to other diseases, stunting the growth of children and dulling their mental faculties.

It was in 1838 that the parasite was positively detected and the infection for which it is responsible established by a scientist of Milan. A series of experiments in various European medical centers and by different authorities followed, physicians and students at first refusing to accept the theory that the parasite was, first, responsible for uncinarasis, and second, that it entered the body in the manner to be now described. Eventually, however, they were convinced by actual photographs taken of the progress of the worm in the bodies of animals subjected to infection.

How the Hook Worm Works.

This leads us up to the more prevalent method by which the hook worm spreads its disease and the almost uncanny manner in which it enters the body of its victim.

It does nothing more nor less than bore its way in embryo form through the skin of the bare human foot, exposed to soil or water, which it selects as a resting place, and makes its progress by devious routes through the circulation to the lungs and from the lungs into the intestines. Here it finds its final destination, reaches adult size, and, attaching itself by a sucker-like mouth, to the mucous membranes, preys upon the blood that is necessary for the healthful sustenance of the body, gradually worrying down the strength of the patient until he or she is brought to the state described in foregoing paragraphs.

Greatest Damage in Rural Districts.

The vast bulk of hook worm disease is found in the rural districts. It does not exist in towns where proper sanitary regulations prevail, or even where people wear shoes all the time.

It is in the districts where the poorer classes go barefoot, where children, during the warm weather discard their shoes, and where the soil is necessary and constantly poluted by human excreta—a condition common to many of the less advanced sections of the State—that uncinariasis exists, multiplies itself indefinitely and takes heaviest tribute of life, health, and working ability.

And thereby hangs a tale, the curious story of how the disease is spread from person to person and the conditions which make its propagation sure and easy.

Every Victim Spreads it.

In addition to suffering himself from the disease, every person affected is an unconscious and innocent agency for its wider distribution. Water closets are an unknown quantity in those rural districts to which reference has been made. Resort is had to places adjoining premises, to places alongside large and small roads which run through every county in the state, of course, and to any other locality that suggests itself to the individual judgment.

The waste products of persons afflicted with uncinariasis literally swarm with the eggs of the parasite. As a consequence it requires no effort of the imagination to understand that the soil in hundreds of rural districts is systematically polluted, recruited year in and year out with incalculable supplies of the little creature so heavy with menace to the health of thousands of people in the South.

As soon as the eggs hatch out it is the first instinct of the larva or embryo worm to seek water whether in the form of mud-puddles along public roads, standing pools about country houses, or perhaps in a drop of dew in grass or weeds.

A child, let us say, and children are the main sufferers because of the barefoot habit during warm weather, crushes with its naked foot weeds or grass near its own home, perhaps paddles in pools along the road side or treads on soil sufficiently moist to encourage the attention of the larva. The tiny insect, as yet invisible to the unaided eye, bores promptly through the sole of the foot—and the mischief is done.

Within a short time after the embryo worm has gained entrance to the body the bottom of the foot becomes irritated and the child, or adult, developes a typical case of what is commonly called "ground itch."

Look for the Ground Itch.

How many children have been attacked by this ground itch? Countless thousands, undoubtedly, and in the great majority of instances it is but the prelude to the subsequent development of uncinariasis, which is, in all probability, destined to warp the child's life for years afterward, and not improbably to lead to its death.

By a circuitous route the embryo worm follows the circulation of the blood into the lungs. Here it bores its way through the arterial vessels into the air spaces of the lungs and from the air spaces it goes into the small bronchi. It then arises with the mucus that collects about it into the throat and is in turn swallowed by the individual and is carried into the stomach and intestines. Here the worm, or worms, catch

fast hold on the walls, or mucous membranes, sucking blood and enlarging until they reach the adult stage in a month or six weeks. It is at this time that the symptoms of the disease manifest themselves. Watch them carefully, searching back carefully for a history of the almost inevitable ground itch in the child or adult, for while the larva is occasionally introduced into the system by drinking water, its invasion in this respect is negligible compared to the barefoot route.

Stunted Growth a Result of Hook Worm.

The subject will become profoundly anemic, that is, bloodless. The skin grows pale, assuming a yellowish tint, and if the infection has been sufficiently severe, shortness of breath and dropsy ensue. Death sometimes follows this stage, but as a rule the patient drags along an enervated, inert, miserable existence, vitality and resisting power infinitely lowered, ready to fall a quick victim to any more virulent disease that attacks the system. That is one of the most pernicious features of uncinariasis, the fact that it so weakens its victim as to make him or her readily susceptible to other disorders that might, in its absence, be combated unnoticed by the system.

Where the disease assails children in their growing years, and that is its stronghold, it invariably paralyzes their mental and physical development. The child is slow to learn, sickly, bloodless and indolent, gaining a reputation for stupidity in the classroom and laziness in the field wholly referable to the disease from which it is suffering, unconsciously to its parents, teacher and itself. Frequently children thus affected reach the years of maturity with childish form and features, unhealthy, unambitious and wholly unfitted to play the slightest effectual part in the work of the world.

The condition continues as a rule for eight or ten years in the adult or child, at the end of which time the ever-corroding worm dies, relinquishes its hold on the intestines and is expelled from the body. As often as not, however, the fearful unsanitary conditions under which the patient lives, and the continued practice of going barefoot, leads to a reinfection, so that the mischief may keep on indefinitely.

Many of the wretched, sallow, hollow-chested individuals currently known as "clay-eaters," are nothing more or less than victims of uncinariasis.

It will be seen that, in cases, even where the child survives this eight or ten-year torture, it has virtually sacrificed its youth, and that its constitution has sustained an impairment from which it frequently never recovers. The years that should have been spent in acquiring knowledge which should equip the boy or girl for life work, are lost, dragged through miserably and listlessly, with apathetic mind and torpid, unresponsive muscles—a dismal and tragic caricature of the buoyant, hopeful and masterful picture youth should present.

The remedy is simple, tragically simple, weighed against the annual destruction of life and the incalculable stagnation to progress wielded by the disease.

The Cure is Simple and Costs but a Few Cents.

The board of health in nearly every Southern State stands ready, too, to diagnose suspected cases, the disease lending itself to infallible diagnosis. Wherever there is reason to believe the disease exists a letter sent to Secretary, State Board of Health, at your capital city—Jackson, Montgomery, Baton Rouge, or what not—will doubtless bring you prompt advice, information, and a free diagnosis.

This in brief is the story and it cannot be too thoroughly learned.

And this is the remedy:

One dose of thymol, perhaps two followed by relaxing medicines.

Your cure is effected, the murderous parasites checked short in their course and within a few months there is a re-made boy or girl, a re-made man or woman, the recuperative forces of the system responding marvelously as soon as the dead incubus against which it has been struggling in vain is removed.

It is emphasized, however, by the State Board of Health, that treatment should not be administered by the patient, but by a competent physician. Fundamental conditions vary with different persons, and the quantity of this well-known drug that may be effectual with one individual may injuriously affect another.

A MESSAGE TO SOUTHERN FARMERS.

Dr. Henry Wallace, who is the editor of *Wallace's Farmer*, and who has been traveling through the South as a member of the Country Life Commission, gives his impression of agricultural conditions in the South and of the needs of the Southern farmer in a letter to the Southern Farm Gazette.

He says, "In my opinion the first and greatest need of Southern farming is humus."

"Humus is the life of the soil, and watchful as we must be of its preservation in the North and West, you have to be doubly watchful in the South where your open winters greatly facilitate the leaching out of fertility. Contrast this with conditions in Iowa: our land is frozen two feet thick in winter, bacterial action stopped, the fertility locked up, and cover crops kept on the land to save any that would otherwise be lost.

"It seems to me therefore that with conditions as they are, the first and biggest thing for Southern farmers to do is to try to get more humus in the land, growing more cowpeas especially, with vetches and clover as cover crops in winter. The saddest thing I have seen in the

Cotton Belt is the washing away of so much land, and this is largely due to insufficient humus. Without it the lands cannot hold moisture nor give it out slowly.

"Dairying would be a great help to you, but you need cattle of better type and blood to make it profitable. The best cow in my herd last year gave 11,300 pounds of milk. A rule with us is to keep one head of stock to the acre all summer.

"You need better horses, in my judgment, and more of them. A one-horse plow in Iowa is almost a curiosity, and so is a plow horse weighing less than 1,200 pounds. I bought a team last spring weighing 1,600 pounds each. On heavy land we put three horses.

"Another great need of the South is to break up your ruinous tenant system. You need to pray to be saved from the farm-owner who lives in town and lets tenants butcher his land. The hope of any State is in its prosperous farm-owners, each living under his own vine and fig-tree.

"You need better roads, too, of course, and I would especially commend to you the split-log drag. It has been a great success in the West the cheapest and most popular good roads-maker we have ever found. It will not do on sandy land, as you know; but on clay and gumbo types it is everything that is claimed for it.

"The price of farm lands in the South naturally interests me, as prices in Iowa range so much higher—from $75 to $150, with $80 perhaps as an average. As to how we make them pay profits on so much I would answer:—

"(1) We keep them full of humus, growing legumes and applying barnyard manure, so keep them increasing in value while spending practically nothing for commercial fertilizers.

"(2) We grow stock and so make two profits instead of one on what we raise, farming twelve months in the year.

"(3) We practice careful rotation—for instance, corn two years, then wheat, then clover.

"(4) We use improved labor-saving, horse-power implements and machinery, at once cultivating, harvesting, etc., better and at less expense than by hand labor.

"I am asked about the way we make our bumper corn yields in Iowa, and if there is much hand cultivation. No there is practically no work by hand from planting to shredding and husking. To begin with, we usually have a clover or bluegrass sod and plow in fall before the ground freezes, in the spring discing thoroughly. We usually plant 3 1-2 feet apart each way—check planting—and harrow before it is up. As soon as up, if land is weedy, we take one-horse or two-horse weeder (with two-horse weeder we can cover thirty acres a day) and kill all small weeds in this way, plowing afterwards from three to six times. The corn breeding associations have done much to stimulate interest in improved seed and the need of improved meth-

ods generally in Iowa, but it cannot be too often emphasized that the whole stalk, and not the ear alone, must be taken into consideration in judging the value of a plant and its desirability for seed purposes. This is one mistake our corn shows have not yet come to realize.

"As the problem of sanitation and general health conditions has been so much discussed, let me say in conclusion, that the farmers of the South are to be congratulated in that The Southern Farm Gazette and The Progressive Farmer refuse to aid in their robbery and injury by advertising patent medicine sharks. This great American fraud, finding its prey, vulture-like, not among the strong and vigorous, but among the afflicted and dying, is one of the most shameless evils in our country, and it is a disgrace to our church papers that many of them carry column after column of advertisements of these patent medicines, some of which foster opium and whiskey habits, and others of which are only a little less disreputable than outright whiskey ads. It is high time for our Christian people to demand a reform here. And the stock food business—well, the thing's a fraud; that's the plain English way to talk about it, and we advise people not to use them.

"But if you can remember but one thing in this message of mine to Southern farmers, let it be this: Get more humus into your soils. That is your hope and your greatest task."

THE QUERY PAGE.

Questions of general interest from farmers, teachers, students and all persons interested in the development of Scientific Agriculture are solicited. Any question not considered of general interest will be answered by private letter. Address all communications to the U. T. Farmer.

What are the Most Economical Rations for Dairy Cows?

First a balanced ration, or one that has the proper proportions of protein, carbohydrates and fat, is of vital importance from an economical standpoint. For example, if a cow is getting a ration with too little of one constituent as protein, she must to get enough protein for her needs eat an unnecessary amount of some other constituent. This extra feed consumed is wasted and the cow also wasts part of her energy in handling it.

Of two rations properly balanced the one that can be gotten the cheapest is of course the most economical and that is the home-grown ration.

Many a farmer loses money on his dairy herd because he does not use the feed he has at hand. Corn silage is one of the best to put into a dairy ration, yet many farmers pay no attention to it. They gather the corn and leave the stalks standing in the field where they are not only a dead loss but are also in the way and must be harrowed down before the land can be properly plowed. This corn cut before it is fully matured and put into a silo makes a nourishing food that is much relished by the cows and makes a good winter substitute for grass.

Where it is not feasible to put the corn into a silo it should be cured and used as stover. In this form it is almost as valuable as timothy hay as is shown by the following comparison.

	Dry Matter	Protein	Carbohydrates	Fat
10 lbs. Timothy Hay	8.69	0.28	4.34	0.14
15 lbs. Stover	8.92	0.25	4.86	0.10

Soy Bean hay is another thing the farmer should feed more of. It is a fine hay, all kinds of domestic animals like it, and it gives a large yield per acre.

Below are given the feeding values of Corn Silage, Corn Stover, Timothy hay, and Soy Bean hay.

	Dry Matter in 100 pounds	Digestible Nutrients in 100 pounds		
		Protein	Carboh.	Fat
Corn Silage	20.9	0.9	11.3	0.7
Corn Stover	59.5	1.7	32.4	0.7
Timothy hay	86.8	2.8	43.4	1.4
Soy Bean hay	88.7	10.8	38.7	1.5

Below is given a good ration for dairy cows:

	Dry Mat.	Protein	Carboh.	Fats	Nutri. Ratio
30 lbs. Silage	6.27	0.27	3.39	0.21	1:6.3
10 lbs. Oats and Vetch hay	9.11	0.43	4.64	0.15	
6 lbs. Barley	5.35	0.522	3.94	0.096	
4 lbs. Soy Bean meal	3.57	1.184	0.89	0.576	
Total	24.30	2.406	12.86	1.032	

Rotation of crops for the above Ration for 30 cows on 150 acre farm, together with 45 steers and a few hogs.

Time of Planting.	Crop.
1909 Spring	Corn for Silage.
1909 fall	Barley.
1910 spring	Soy Beans.
1910 fall	Oats and Vetch.
1911 spring	1-2 Sorghum & Cow Peas (pasture) 1-2 Soy Beans.
1911 fall	Crimson Clover.

A. (60 Acres.)	B. (65 Acres.)	C. (25 Acres.)
Barley.	Oats and Vetch.	
Soy Beans.	Soy Beans (40). Sorghum and Cow Peas (25).	Corn.
Oats and Vetch.	Crimson Clover.	

—A Student.

WATER TRANSPORTATION DEVELOPS MARKETS.

Our 225,000 miles of railroads are entirely inadequate to take care of present crops. Those familiar with our exact needs say we require 100,000 more miles of railway and then only the most urgent needs would be met.

Our whole country is becoming agitated over the need of increasing greatly the facilities of our water-ways. There is much justice in this agitation. Old countries who have met years ago the problems that we are approaching now have found large sums of money spent on water-ways their wisest investments. France, Germany and Russia have cheapened transportation, developed markets and lessened the cost of producing for the working man and his family by providing hundreds of miles of water-ways.

According to the best authorities it takes 1000 tons of steel in rails to move 1000 tons of freight 10 miles, while the same amount of freight on water may be moved for 10 to 20 per cent. of the steel investment and for 50 to 75 per cent. less fuel.

A Mississippi steamer moderately equipped will carry 67,000 tons of coal in tow. In our great lakes 20,000 tons may be handled. One grain boat on the lakes is capable of handling the product of 27,000 acres of average wheat land.

In speaking of this matter Dr. Snyder, Pres. Agrl. & Mech. College of Mich. says "A ship canal from the lakes to the gulf with an extension of the system to the tributaries of the Mississippi, would be an undertaking well worthy the genius and energy of our American people, and easily within accomplishment.

Were this great system completed the products of thirty of our great states lying between our eastern and western mountain ranges would enjoy the tremendous advantage of water transportation, and twenty thousand miles would be added to the coast line of the Republic.

Water routes are necessary for transportation and in fact indispensable to the future development of this country. Can the products of the great Mississippi basin, when the population shall have reached several hundred millions, be hauled in freight cars over the great mountain ranges on either side? Land transportation can only be solved by the co-operation of water transportation. The vast railroad problems can best be settled by the development of our inland water-ways.

A dollar paid for freight will carry a ton on the Soo canal one thousand miles. On the Erie canal 526 miles. On the new Erie canal it is estimated that it will carry it 1,900 miles, while on the average, a dollar on the American railways will take a ton but 133 miles. America has the greatest natural system of water-ways in the world. The Mississippi river is the natural dominating center of this system. With its tributaries it touches all but sixteen of our forty-six states.

To make this river a ship canal from the lakes to the gulf would be the beginning of a most splendid commercial development. Chicago, very wisely, has spent sixty million dollars to open it as a drainage ditch and barge canal. It is estimated that 100 million more would make of it a ship canal with from fourteen to twenty feet of water, and that if it cost 200 million, it would pay for itself every year.

This one stroke would give to this continent a new seaboard from Canada to New Orleans. It would afford permanent relief to the congested freight centers of Chicago and St. Louis and lighten the load of tonnage from Duluth through Cleveland and Buffalo. The East and the West would make of it the busiest canal in the world.

In the fall, the 4,000 boats now engaged in lake trade alone and consequently compelled on account of ice to lie dormant for six months of each year, would load up with corn, wheat and hay, and ship this freightage at very small cost to hundreds of southern cities, and around the coast to eastern cities, which need them. This great fleet would pass out into the gulf and south to Panama and the South American republics and restore to the salt seas our merchant marine, carrying profits during winters now idle. In the early spring they would start north with cotton for a hundred manufacturing centers yet to be developed; with the next year's supply of fuel for the North and great Northwest from the coal fields of Alabama, or perhaps with coal to supply the great ship yards and other industries to be established near the ore deposits on our lakes. Southern lumber would come North almost as cheaply as it would float South on the bosom of the Father of Waters; cattle by the hundreds of thousands would be shipped to our wonderful grazing lands in the North and back to the corn belt in the fall to be finished for the market.

It would bring the ocean with all its marvelous advantages of water transportation, to the Western and Southern farms.

ATHLETICS IN THE COLLEGE OF AGRICULTURE.

From the Cornell Countryman.

The College of Agriculture is in the front rank among the colleges of Cornell in its athletic spirit. This is as it should be for the class of material is of the best, comprising as it does a student body whose physiques have been accustomed to a healthy outdoor life before coming here, and whose natural tendency is to continue the active life which they have previously led.

Cornell's prominence in all branches of college sport is of recent growth and the College of Agriculture has been a leading factor in its development. It was not many years ago when a victory in any sport besides rowing was of rare occurrence and the lack of material was given as the reason for our failure to hold our own with other uni-

versities. Those most interested in our athletic success predicted the good results that the College of Agriculture was to bring us, and always used the argument, "Wait until we get our Agricultural buildings and then we will have the material with which to win." The results attained in athletics since the completion of this college have certainly verified their prophecy.

The plan of giving gymnasium credit for participation in any branch of sport is a great incentive to students to do something in Inter-college, class, or varsity athletics. It gives an opportunity to those who have never taken part in competition to try themselves out against others as inexperienced as themselves, in the Inter-college and class contests, while the experienced men may always strive for the varsity teams. Our athletic competitions are graded in such a way that a man need give very little of his time and yet may make some team. Many fine athletes have been developed for the varsity teams by a little participation in Inter-college and class athletics when the student was fearful of having to give too much time trying for the varsity team, it being a serious question with him of doing sufficient work to stay in the University. When sure of their standing in their classes, the men tried for the varsity and made it, the training both in knowledge of the sport and the betterment in physical condition from the casual work in these minor contests making of them athletes of varsity calibre.

The good-fellowship and self-reliance gained in athletics by the average student who, through home situation or other reasons has never had much opportunity to mingle with the world, are among the notable benefits which the College of Agriculture ascribes to athletics. In the athletic Hall of Fame at Cornell University the College of Agriculture has many members. No college in your midst can show more able leaders of more versatile athletics in sports where brain and brawn have counted for most. Let everyone do something to increase the interest in your college for general participation in athletics and you will be doing your share in the development of the true Cornell spirit in the College of Agriculture.

Of last year's "C" men ten were in the College of Agriculture, representing each of the major sports. The holder of the inter-collegiate heavy weight wrestling championship is a member of the class of 1911, Agriculture, and F. J. Porter, inter-collegiate shot-putting champion in his senior year was one of the college's early stars. The College holds the Inter-college Cross Country cup at present and has made strong fights in the inter-college crew, track and baseball contests. Such is the record of the College of "Farmers," and it is a good one. It devolves upon its present and future members to maintain and augment this standing in athletics as well as in other activities.—John F. Moakley.

AGRICULTURAL EDUCATION.

EMERSON'S "FARMING."

This picture is such a perfect combination of good art and bad agriculture as to make it a pernicious model and standard for an intellectual cult who get their knowledge of mankind second-hand as they get their knowledge of nature from the nature fakirs.

Had the author been content to use his cultivated appreciation of nature and human nature by simply representing a type of farmer as he found him the picture would have been as accurate historically as it is fine considered as art. But some things are happening that never before happened in the history of the race, and some changes have been so rapid that he whose conception became fixed longer ago than yesterday is already behind the times. And any expression or action based on such conception is erroneous. Emerson's error is in attempting to prescribe for all time a condition which—under his very eyes had he but seen—was depopulating rural New England.

The reaction of nature on the passive and receptive individual will doubtless always be as here so truthfully represented. But education of the modern kind destroys passiveness and the activity which carried the farmer of the east into other professions has broken the bonds of the western farmer and he isn't now "timing himself to nature."

For instance the jayhawker began to be conscious of himself some twenty years ago and he proceeded to spoil the picture which Emerson and many others before and since had reduced to a formula and which in its conventional form has been indefinitely reproduced in literature, art, and the drama. His first diagnosis was that he had some kind of political ailment and for several years he proceeded to upset political dope and put himself on record as dissatisfied with Things in General.

But while a disposition to repudiate "the parsimony of his strength" his "powers meekly worn" and "of the subduing and silencing" effect of his vocation spread to his neighbors his weakness was found to be his ignorance of protoplasm as well as politics. And as a result there has been evolved a new standard of art.

For the intelligent young farmer considers himself as something more on the landscape than the oak tree, the haystack, the river, or the hill. He has no ambition to fit his environment simply as do the kilts and bare legs of the Highlanders or the wooden shoes and fish wives of France. He believes it possible to "shine in palaces" and "drawing rooms" and even in emergencies to wear a claw hammer coat with correctness of time, place, and fit without being "excused from tillage." And in politics he means to know the game at least well enough to see that it is played fair.

Too bad it is if the farmer is to lose all sense of his obligation to remain picturesque agreeable to the aesthetic tastes of those who need an Uncle Josh Whitcomb to amuse them or the more respectable class who know from study and travel what a farmer ought to be like and has been like from the beginning—too bad that he refuses to stay put. Doubtless the old type of farmer will continue to be found for some time to come and we may have to call the new type the agriculturist—a name that is rapidly becoming respectable—but nevertheless the artist's dope is spilled beyond recovery.

Hereafter the pastoral poet who goes out hunting is doomed to return many times disgusted and disappointed for want of game. For when he scratches his peasant he may find a student. And the landscape artist who makes his living by painting pictures to sell would better begin to develop the aesthetic possibilities of the silo, the manure spreader and the alfalfa patch. For on such is based the future happiness of the race.

AGRICULTURE IN THE HIGH SCHOOL.

From "A Manual for High Schools."

I. Point of View.

Order is heaven's first law and this manual is an attempt to give the appearance of order, to a matter that is more or less confused in school men's minds. In recent years the course of study for the high has been carefully worked out and agreed upon and in its approved form is either the working plan or the ideal of standard high schools. Such course includes a generous amount of work in physics, chemistry, physical geography, botany, zoology and physiology. Since the best method of illustrating any unknown fact or principle is by means of familiar materials and since to a vast majority of pupils these for the sciences mean agricultural materials, economy dictates the use of what the rural environment affords in teaching all sciences, and no science should be attempted that cannot be demonstrated by some means; or stated conversely from the industrial viewpoint, since agriculture depends on a knowledge of all the sciences the only way to put agricultural instruction on a safe, rational basis is to correlate it with the underlying sciences and teach both together without attempting to draw any very sharp line to indicate when we pass from the cultural to the industrial use. Granted that scientific subjects *where as well taught* have a cultural value not inferior to other subjects in the curriculum and that therefore they should be as liberally provided for, and granted further that a reform in education in the interest of industrial vocations is imminent, how may schools most economically meet the two requirements? Here the school man is hesi-

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tating while the advocates of industrial education are not. The writer as a school man of some variety and length of experience insists that if education is to be reformed "the revision should be by its friends" that we may be saved the expense of a dual system of public education and that the ancient landmarks of pedagogy be preserved. And in the present situation it is hard to tell which is worse, the fellow who sees nothing but agriculture or the fellow who will have none of it.

An argument for the introduction of agricultural courses into all secondary schools (high schools) maintained by taxation of an agricultural public should not be necessary and is not here attempted. This manual is intended to set forth a method by which the high school may not only provide agricultural instruction to prospective farmers, teachers of rural schools, and preparatory students for whatever course or vocation, but also to show how the correlation of such agricultural work with the high school science work may *immeasurably enhance the value of both*. In the course of study following, the idea of utilizing agriculture for the foregoing purposes is worked out and the order in which various sciences are arranged and developed in the course is not only an approved scientific and pedagogical order but will also be found to satisfy the order imposed by the succession of seasons. For there is a tide in the affairs of the farm home which the agricultural teacher should take at the flood, launching his topics at the right psychological moment to attain the maximum of interest and to affect most profitably the succeeding crop.

Whether the college or university endorses a plan of education that is successful locally is a matter of small concern to the school since so few of its students are destined to go farther than the home school. The high school is the people's college and any warping of its course merely to satisfy college entrance requirements indicates a misconception of the function of the public school system. However there should be no war here as the universities stand for this same idea of education and will meet any school that provides the proper amount of thorough profitable work on any subject. The high school is less dependent on maintenance of accredited relationship that the college or university is.

An examination of the agricultural topics enumerated in this course of study should convince one that like all other subjects taught in the high school the only safe preparation for the teacher is collegiate training; and very much of the work now from necessity presented only in the agricultural colleges is no more than secondary in grade and is destined to be removed to the high schools as soon as they put themselves in the proper attitude to receive it. For such services the best high schools will, as they now do in the case of other instructors, pay more than the college or university pays its instructors which because of their scarcity is also more in the case of agriculturists than of other expert teachers of equivalent attainments.

The problem of giving agricultural instruction in high schools is one of preparation of the teacher, of cooperation of the community and of providing the funds. The board should therefore expect to provide more means and know what the additional expense is to be before installing the course. What that additional expense is to be depends upon the plans of the school, the extent to which the community is willing to cooperate, and the ability of the agriculturist to get the most out of his equipment and environment.

The ultimate aim of agricultural education has not always been clearly defined. To many of its strongest advocates and the industrial masses generally it means greater efficiency in the work by which they maintain themselves and their families, and an alleviation of hardships. Praiseworthy though these motives may be, to the writer it means much more as an educational reform than it does as an industrial reform simply, a statement of reasons for which belief would be argumentative and are therefore omitted. But that belief explains the point of view and for that reason is mentioned. As an educational reform its origin is the universities and its destination the high schools in which many of the influential citizens of the future are to get their final training and the rural schools of which none are too humble or too poor to have the benefit. And as the only practicable route by which the rural schools may get the benefits of the reform is by way of the high school of which every county is destined to have one or more, the high school should be made the rural teachers' training school. The high school should therefore send its students in three directions—to active life, to the college, and to the rural school.

The subject of agriculture should be incorporated into the science work of the high school and not superimposed upon the already crowded high school course—a mistake that has been made often enough that it should begin to be apparent to the friends of agricultural education. And for this purpose only the "principles" of agriculture (or any other vocation) have a right to a place in the course. That all principles of agriculture are scientific principles and as such are the most familiar and available for cultural use is here asserted and in the accompanying course of study clearly illustrated. Courses of study providing specifically methods and practices in the economies of cultivation of particular crops, harvesting, preservation, breed peculiarities, care of herds—all being matters of information and skill in the vocation of agriculture have no more place in a general high school course than have the methods and technical phases of commerce, telegraphy, music, photography, pharamey, assaying or a multitude of other subjects which the high school course deals with theoretically but without aiming to turn out skilled operators. The advocates of agricultural education in the high school should be satisfied to have accurate instruction given in the general principles of the vocation to such extent that the pupil will have both incentive and ability to master the

details in his own peculiar way. Such instruction should not be merely general information but should be technical in a sense but it should be the technique of science and not the technique of agriculture. To demand more than this will be to destroy the value of the course for general class uses, to arouse the just opposition of school men (whose jealousy of educational principles involved is even now very apparent) and to injure and delay the cause.

The scientific principles involved in agriculture are limited in number and quite definite in character. But there is no limit in theory nor in fact to agricultural methods and practices. And these latter in a high school course of study have no value to the large majority of students who should understand the principles. The high school cannot hope to produce operatives as well prepared for immediate employment as can the business colleges and the training and industrial schools though it does give all the training for a far greater success in those callings than can any short course of concentrated effort. And the reasons for this are deep seated and involve the psychology of adolescense. Agreeable to these reasons the proper relation of the high school to vocation is as a means of discovering natural talent for the vocations by giving as wide a field for the pupils' preference as posible. Beyond this amount of instruction the teacher of agriculture can quite properly devote such time as he can spare to instruction of those pupils who have elected agriculture as a vocation in the best agricultural practices but this latter purpose should always be secondary.

SHORT WINTER COURSE IN AGRICULTURE AT THE UNIVERSITY OF TENNESSEE. JAN. 4-MAR. 13, 1909.

Tuition Free. No entrance examinations. Courses divided into two-weeks periods; may be taken singly or as a whole. Open to everybody sixteen years of age or over who can read and write.

THE COURSES

Course I.—Jan. 4-16—Soils, Fertilizers, Farm Crops

Professors Mooers, Bain, and Morgan

The morning hours are devoted to lecture and class work on soils. their structure and elements; kinds of soil adapted to various farm crops; tillage; barnyard manure; commercial fertilizers, their elements and value; plant food required for certain crops; rules for mixing fertilizers; the leading farm crops of Tennessee; diseases of farm crops; insects injurious to farm crops.

The afternoons are devoted to the judging of corn and other cereals. inspection of plots at the Experiment Station farm, and visits to the best farms in the neighborhood of Knoxville.

Course II.—Jan. 18-30—Live Stock

Professor Morgan, Assistant Professor Quereau, Dr. Jacob

Lectures and class-room exercises on breeds of stock, including horses, cattle, sheep and hogs; feeds; the management of forage crops; the composition of food stuffs; feeding to produce the best results at least cost; nutritive ratio; problems in making rations, etc.; diseases of live stock, with treatment.

The afternoons are devoted to the judging of horses, beef cattle, sheep and swine.

Course III.—Feb. 1-13—Dairying

Assistant Professor Quereau, Mr. Dennis

Lectures and class-room exercises on the dairy breeds; composition of milk; rations for milk cows; forage and ensilage crops, silos; testing dairy cows; testing milk by the Babcock test; separators, dairy machinery, etc.

The afternoons are devoted to work in the dairy barn and creamery, every student having practice in the care of boiler and engine, separating milk, churning, butter working, and all operations connected with the dairy.

Course IV.—Feb. 15-27—Horticulture

Professor Keffer

The morning hours are devoted to lectures on the leading truck crops—potato, tomato, cabbage, melon, etc.; hotbeds; cold-frames; seedage; transplanting; small fruits; grapes; orchard fruits; orchard management—tillage, pruning, spraying, harvesting, root-grafting, top-grafting, and budding.

The afternoons are occupied with practice in pruning trained and neglected grapevines, peach, apple and other trees, and in spraying.

Course V.—Mar. 1-13—Bee Keeping

Assistant Professor Bentley

Lectures and practice. The subjects are, study of the habits and development of the honeybee; types of bees; queen rearing; methods for improving run-down apiaries; disease and parasites, with remedies; management of an apiary; types of hives; the out-apiary; selection and culture of bee plants.

EQUIPMENT

The Experiment Station farm of the University of Tennessee is one of the best in the United States. The extensive plots and the splendid condition of the fields and meadows afford every opportunity for study and for illustration. Experiments in feeding beef cattle (high-grade Shorthorns) will be in progress at the farm and fine examples of the

best breeds of dairy cattle, sheep, and hogs will be available for use in stock judging. The dairy barn, silos, and dairy give unusual facilities for the study of dairying.

The experiment orchard and vineyard contain the leading commercial fruits, and are used freely in instruction.

Several colonies of bees, and a complete equipment of accessaries, make possible full demonstrations in bee husbandry.

Morrill Hall, in which Short Course lectures are given, is the newest and best building on the University campus, and contains a large agricultural library, to which the students have free access.

In addition to the facilities provided by the University, excursions to farms, market gardens, orchards and dairies are arranged for the Short Course students.

PRIZES

County Contest

First Prize—The East Tennessee Farmers' Convention and Institute offers $100.00 for the county (Knox excepted) that sends the largest number of students to the Short Courses; the money to be divided equally among the students from the successful county. This prize is offered upon the condition that as many as eight students from one county take at least one full two-weeks course.

Second Prize—The Tennessee State Fair Association offers $75.00 for the county sending the second largest number of students.

Individual Contests

Prizes will be awarded to individual students for the best work in the different courses, as follows:

$10.00 in gold, awarded for proficiency in judging light horses; given by Hon. Edward T. Sanford, Knoxville, Tenn.

$10.00 in gold, awarded for the best essay on "Fertilizers," with special reference to the value of potash; given by the German Kali Works, New York, N. Y.

$10.00 in gold, awarded for the best essay on "The Value of Commercial Fertilizers in the Building Up of Poor Land"; given by the Virginia-Carolina Chemical Co., Atlanta, Ga.

$10.00 in gold, awarded for proficiency in fertilizers; given by Mr. Wm. S. Myers, New York, N. Y.

$10.00 in gold, awarded for proficiency in feeds and feeding; given by Messrs. J. Allen Smith & Co., Knoxville, Tenn.

$10.00 in gold, awarded for proficiency in the handling of cream separators; given by the DeLaval Separator Co., New York, N. Y.

$10.00 in gold, awarded for proficiency in judging beef cattle; given by Messrs. Davis & Susong, Knoxvile, Tenn.

$10.00 worth of advertising space in the Industrious Hen, awarded for proficiency in the course in Bee Keeping; given by the Industrious Hen Co., Knoxville, Tenn.

$10.00 worth of bee keeper's supplies, divided into three prizes, valued at $5.00, $3.00, and $2.00, respectively; awarded for best three essays on "The Value of Bees to Fruit Growers"; given by the A. I. Root Company, Medina, Ohio.

One three-wheel sweep rake, valued at $25.00, awarded for proficiency in all courses; given by the International Harvester Co., Chicago, Ill.

One dozen Italian queen bees, valued at $17.00, divided into three prizes of 6, 4, and 2 queens, respectively; awarded for best three essays on "The Growing of Honey-yielding Plants that are of Value to the Farmer"; given by Mr. John M. Davis, Spring Hill, Tenn.

EDITORIAL.

The Farmer is attempting this month to correct its mailing list of those to whom it is sent free of charge. As we have no means of knowing where the magazine fails to reach the one to whom it is addressed, readers may oblige such persons as well as ourselves by giving us information concerning change in address of any member of the agricultural classes of the Summer School courses of 1907 and 1908. Our present address for such persons is the one each gave on registration and our three months' suspension during the summer makes us specially liable to lost track of those teachers who change location at that time.

PERSONALS.

Mr. F. H. Dennis, of the Ontario Agriculture College, is in charge of the Dairy Department this year. Mr. Dennis predicts a great future for the Southern dairyman.

Mr. A. T. Anders is on the hill again and reports the cotton experiments a success.

Dr. Ayres, Prof. Morgan and Prof. Main attended the meeting of University Presidents and Experiment Station Directors and other educational conferences held in Washington the last of November.

Prof. Quereau has his steer feeding started. He has a good lot of feeders, and no student should miss observing this experiment if he is interested in steer feeding.

R. Shofner, ex-'09 is running his father's farm over in Bedford Co., near Shelbyville.

Mr. Herman Work is in Pennsylvania State College this year taking Forestry. We are sorry to lose Mr. Work but the situations were such that it is probably better that he gave up the work here.

Professors Morgan, Moores, Bain and Quereau attended the Farmers Institute at Nashville.

Messrs. Landess and Wilson, ex-'10 are taking agriculture in the University of Missouri.

Thetford, ex-'09 is taking agriculture in the University of Arkansas.

DEBT OF CIVILIZATION TO AGRICULTURE.

There can be no doubt, but that movables of every kind became sooner appropriated than the permanent, substantial soil; partly because they were more susceptible of a long occupancy; but, principally because few of them could be fit for use, till improved and meliorated by the bodily labor of the occupant; which bodily labor bestowed upon any subject that lay in common to all men, is universally allowed to give the fairest and most reasonable title to any exclusive property therein.

The article of food was a more immediate call, and therefore a more early consideration. Such as were not contented with the spontaneous product of the earth, sought for a more solid refreshment in the flesh of beasts, which they obtained by hunting. But the frequent disappointments incident to that method of provision, induced them to gather together such animals as were of a more tame and sequaceous nature, and to establish a more permanent property in their flocks and herds in order to sustain themselves in a less precarious manner.

When the multitude of men and cattle had consumed every convenience on one spot of ground, it was deemed a natural right to seize upon, and occupy such other lands, as would more easily supply their necessities. * * * As the world grew by degrees more populous, it daily became more difficult to find out new spots to inhabit, without encroaching upon former occupants; and, by constantly occupying the same individual spot, the fruits of the earth were consumed, and its spontaneous products destroyed without any provision for future supply or succession. It therefore became necessary to pursue some regular method for providing a constant subsistence; and this necessity promoted the art of agriculture. And the art of agriculture, by a regular connection and consequence, introduced and established the idea of a more permanent property in the soil, than had hitherto been received and adopted.

It was clear, that the earth would not produce her fruits in sufficient quantities, without the assistance of the tillage; but who would be at the pains of tilling it, if another might watch an opportunity to seize upon and enjoy the product of his industry, art, and labor? Had not, therefore, a separate property in lands, as well as movables, been vested in some individuals, the world must have continued a forest, and men have been mere animals of prey.

Necessity begat property; and in order to insure that property, recourse was had to civil society, which brought along with it a long train of inseparable concomitants; states, government, laws, punishments and the public exercise of religious duties. Thus connected to-

gether it was found that a part only of society was sufficient to provide, by their manual labor, for the necessary subsistence of all; and leisure was given to others to cultivate the human mind, to invent useful arts, and to lay the foundations of science.—Blackstone.

THE CEASELESS TRANSFORMATION OF MATTER.

The idea of the indestructibility and ceaseless change of matter leads to curious reflection. When an animal body decomposes whether the process occupies four hours, four months, four years, or even four thousand years—any one of these periods being quite possible—those elements which assume the gaseous form mingle at once with the atmosphere, and are taken up from it without delay by the ever open mouth of vegetable life. By a thousand pores in every leaf the carbonic acid which renders the atmosphere unfit for animal life is absorbed, the carbon being separated and assimilated to form the vegetable fibre, which, as wood, makes and furnishes our homes and ships, is burned for our warmth, or is stored up under pressure for coal. All this carbon has played its part and many parts, in its time, as animal existences from monad up to man. Our mahogany of today has been many negroes in its turn, and before the African existed was integral portions of many a generation of extinct species. And when the table, which has borne so well some twenty thousand dinners, shall be broken up from pure debility and consigned to the fire, thence it will issue into the atmosphere, once more as carbonic acid, again to be devoured by the nearest troop of hungry vegetables—green peas or cabbages in a London market garden, say—to be daintily served on the table which now stands in that other table's place, and where they will speedily go to the making of "lords of creation." And so on, again and again, as long as the world lasts.—Sir Henry Thompson.

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AN UNHEEDED WARNING.

It must be obvious to every man who considers the agriculture of this country (even in the most improved parts of it), and compares the produce of our lands with those of other countries in no ways superior to them in natural fertility, how miserably defective we are in the management of them; and that if we do not fall on a better mode of treating them how ruinous it will prove to the landed interest. Ages will not produce a systematic change without public attention and encouragement; but a few more years of increased sterility will drive the inhabitants of the Atlantic States westwardly for support; whereas if they were taught how to improve the old instead of going in pursuit of new and productive soils they would make those acres which now scarcely yield them anything, turn out beneficial to themselves. In a word, it is in my estimation a great national object.—Washington.

THE U. T. FARMER

Vol. III. JANUARY 1909 No. 4

THE GROWING OF ALFALFA IN TENNESSEE.

A Talk Before the Middle Tennessee Farmer's Convention in December.

In selecting a subject for discussion at this Institute, I thought that alfalfa growing in our own State would be appropriate, for the majority of farmers have tried a field or patch, and those who have not expect to try their hand at it before they die. Some way or other a great many folk think the getting of a stand of alfalfa the *summum bonum* of agricultural achievment. It is as much my purpose to discourage the promiscuous attempts which in the past have proved negligible in regions where it can not be grown profitably under present conditions, as it is to recommend it under proper methods of preparation for sections where it is likely to succeed.

Another object in discussing this subject at this time is to emphasize the value of *ground limestone rock* and to recommend its use on most of the soils of Tennessee in connection with the improvement of meadows and the growing of legumes as well as for alfalfa.

From the results procured through the Chemical Department of our Experiment Station during the last few years it is very evident that most of the soil areas of the State would be greatly benefited by the application of lime, and it appears that those sections otherwise adapted for alfalfa fail in the production of this crop largely because of the lack of sufficient lime.

In taking a vote of this audience, I found that the majority of you have tried or intended to try, alfalfa. Of those who have tried it, fully 90 per cent. have failed because of the presence of the crab grass. While this is the arch enemy of alfalfa, there are other things which must be carefully considered if success is to crown our efforts.

No one who has not had considerable experience with this plant should attempt a trial of more than one or two acres. And by experience I mean a knowledge of its habits from having grown and studied it—not from having read of it, but from having tried it and, possibly failed. We can not expect to succeed with alfalfa through our knowledge of red clover or alsike, or by methods used in the procuring of these, unless conditions are ideal.

Clean land (free from crab-grass, foxtail, and such winter weeds as chickweed and dead nettle, particularly), abundant vegetable matter in the soil, good drainage, plenty of lime and phosphorus, ideal preparation, if necessary, for a season or two in advance, inoculation, and a liberal sowing of pure, germinable seed, may be given as the essential considerations for success with alfalfa. After the plants are well rooted (nine months to one year old) cultivation if carefully done will prove beneficial on most soils in maintaining the stand and increasing the yield.

It is significant that where alfalfa has been most successful in the State, lime and phosporus, and sufficient vegetable matter, are not wanting in the soil. In some instances these have been artificially applied in liberal amounts. With these forming a general backbone for a plan of procedure, let us suggest a line of preparation for those who are desirous of devoting an acre or two to alfalfa.

So much money has been wasted in all sections of the State in efforts to get this crop, that a word of caution is warranted. It is this, that under average conditions as we find them real success in alfalfa growing is entirely outside the realm of careless, indifferent farm practice.

With conditions as they exist in Tennessee it seems best to plan for alfalfa two years in advance. If it were available, from 20 to 30 loads of manure should be applied to the land per acre. Manure is not by any means as abundant as it should be in our State, and if it can not be had, seed the land late in the summer to a green-manure crop, selecting the crop surest to give results under your conditions—crimson clover, rye, fall barley, fall oats, wheat, or a mixture of crimson clover or hairy vetch and any of the cereals enumerated. It may be convenient to turn under a crop of cowpeas or a second crop of clover before sowing the green-manure crop. In the spring, just prior to turning under the green crop, make an application of from 400 to 500 pounds of acid phosphate or Thomas slag meal, provided you are not on land naturally supplied with phosphorus. In case manure is used instead of a green-manure crop to supply vegetable matter, the acid phosphate or Thomas slag meal should be applied before the manure is turned under. After the land has been smoothed in the spring, a top-dressing of lime should be made—of burnt lime one to two, or more, tons per acre may be applied, or of lime rock two to six, or more, tons. With limestone as abundant as it is in Tennessee, especially where it can be produced in the powder form, such as the samples I have here, for from 50 cents to $1.00 per ton, our lands should not go begging for an application of even ten tons per acre. After discing in the lime, plant to some clean-culture crop. Irish potatoes are an excellent clean-culture crop if the application of lime does not increase scab; soy beans planted in 36-inch rows at the rate of 1-2 bushel per acre, are strongly recommended, as they may be planted later and give ample time for thorough preparation even though the spring be late. Whatever crop be used, the absolute elimination of weeds

and grass must be insisted upon. In case soy beans are used they may be taken off for hay in August in order that the ground may be put into shape for fall oats, fall barley, or other cereal, or for an early-sown cereal with hairy vetch to be removed for hay the following May. After the cereal is removed, either for grain or hay, the land should be turned and thoroughly fallowed until the middle or the last week of August, when, after the conservation of moisture, the careful and unstinted preparation of a seed bed, and the inoculation of the land by the harrowing in of an application of 300 or 400 pounds of dirt from a field where alfalfa has grown successfully, 30 pounds of pure germinable seed should be sown—15 pounds each way—and lightly covered with a harrow or heavy weeder.

In case chickweed or dead nettle are in possession of the land during the late fall, winter, or early spring, the cereal should not be sown after the soy beans, but the ground kept clean by cultivation until February or March, when a crop of spring oats and Canada field peas may be sown for a hay crop. Chickweed must be reckoned with in the getting of a stand of alfalfa this far South, as its encroachments in winter are as insistent as those of crab-grass in summer.

On fertile land, rich in vegetable matter, a crop of soy beans may be grown for hay the second summer instead of fallowing. This, however, will limit the amount of moisture necessary for germination and successful fall growth of the alfalfa unless plenty of rainfall obtains. After the second crop of soy beans the land should be disced, not plowed, and put into a state of perfect preparation by surface harrows.

The care of alfalfa the first fall and the following summer is important. Should an open fall be experienced, and 18 to 20 inches of plant growth be secured, the clipping of the upper parts of the plants so as not to leave them shorter than 12 inches, is sometimes advisable, though the condition of the ground should be taken into consideration. Pasturing the first fall is positively detrimental, and very light pasturing should be allowed the following summer. After the second cutting of hay, if the weather be dry and some crab-grass and weeds appear, harrowing to destroy the grass and weeds and to secure a mulch, is recommended. In case insufficient vegetable matter be present in the soil, and the ground becomes packed by the winter and spring rains, careful discing two ways, with the discs straight, before the spike or tooth harrow is used, will be advantageous. Judgment will have to be exercised in the cultivation of alfalfa, both the plant and the condition of the soil getting due consideration. Crab-grass, however, must be gotten rid of, or the alfalfa is doomed.

You will see from what I have said that an abundance of vegetable matter, applied well in advance to insure the destruction of weeds and grass seed (in manure), and to get the vegetable matter adequately incorporated with the soil; liberal applications of phosphorus (on lands not naturally supplied) and lime; clean cultivation, whether by crops

or fallowing, or both; through preparation of seed bed; inoculation by the use of alfalfa soil; plenty of good seed; and judicious cultivation are recommended. Tile drainage and subsoiling, while just as important as the foregoing conditions, are more local in their application, certainly for the middle and eastern sections of the State, and may be avoided by the selection for trial of a few acres of land of good natural drainage.

Some farmers regard alfalfa as not of sufficient value to warrant such effort, and will leave it out of their plans until the condition of their land has been improved by the feeding of live stock upon the farm, and by the use of intelligent rotations and systems of management, when alfalfa may be secured by shorter routes and less planning.—H. A. Morgan.

FACE THE FACTS.

The ostrich escapes from danger by hiding its head in the sand so that not seeing, it may persuade itself that there is no danger. Equally reasonable seems the attitude of some authorities worthy of respect toward the danger to this country of the spoliation of our natural resources and the risk to our great source of American citizenship, the rural poulation, of the very evident tendency away from the farm of our sturdy democratic stock that has there developed its best characteristics. It is a cheap mode of flattery to tell people that they are all right and need nothing to increase their happiness. It is the complacency of self-satisfaction that makes danger dangerous.

All of which foregoing observations are induced by the attitude taken by some of the leading newspapers and agricultural journals toward two most noteworthy undertakings of the last year of President Roosevelt's administration—the Governor's Conference and the Country Life Commission. And even the Grange in national session in November so far misunderstood the motive or resented the implied criticism as to suggest by resolution that the president appoint a commission to investigate city life and find out what is the matter with it.

The only criticism we could make, and that was suggested by another is that the president should have appointed a commission to investigate to what extent the farmers' troubles are due to class legislation. But the opportunity is so rare and occasion fraught with such possibilities that the agricultural masses are willingly giving testimony to the commission that should be a safe guide for all of our legislative bodies that desire to give the tardy justice that is due the most worthy portion of our population. And in this connection we are pleased to include a portion of Mr. Bryan's speech before the Governors' Conference and the comment of two leading agricultural journals of the South.

Mr. Bryan's Speech at the Governors' Conference, Washington, D. C., May 13, 1908.

"I hesitate to speak at all because the governors who are assembled here represent constituencies, and those constituencies, well marked, are looking to them for the protection of state interests in conjunction with the development of National interests, and I recognize that a private citizen like myself with no fixed constituency (laughter and applause) speaks, if he speaks at all, either for himself or for a nebulous portion of the nation. I recognize that such an one is not only under the same obligation that the governors are, but that he speaks with less authority; and I have been anxious that those who were in official position should discuss these questions and leave to us unofficial visitors the bringing up of the rear end, so to speak, of the discussion. * * *

"I am a strict constructionist, if that means to believe that the Federal government is one of delegated powers and that constitutional limitations should be carefully observed. I am jealous of any encroachment upon the rights of the states, believing that the states are as indestructible as the union is indissoluble. It is, however, entirely consistent with this theory to believe, as I do believe, that it is just as imperative that the general government shall discharge the duties delegated to it, as it is that the states shall exercise the powers reserved to them.

"There is no twilight zone between the Nation and the State, in which exploiting interests can take refuge from both, (great applause), and my observation is that most—not all, but most—of the contentions over the line between Nation and State are traceable to predatory corporations which are trying to shield themselves from deserved punishment, or endeavoring to prevent needed restraining legislation. The first point which I desire to make is that earnest men, with an unselfish purpose and concerned only for the public good, will be able to agree upon legislation which will not only preserve for the future the inheritance which we have received form a bountiful Providence, but preserve it in such a way as to avoid the dangers of centralization. Nothing that is necessary is impossible; and it would be a reflection upon the intelligence, as well as upon the patriotism of our people, to doubt the value of gatherings of this kind. * * *

"I begin with the proposition that it should be our purpose, not only to preserve the Nation's resources for future generations by reducing waste to a minimum, but that we should see to it that a few of the people do not monopolize that which is in equity the property of all the pople. (Applause.) The earth belongs to each generation, and it is criminal to fetter future generations with perpetual franchises, making the multitude servants to a favored faction of the population, as it would be to impair, unnecessarily, the common store. (Applause.) I am glad that Secretary Garfield emphasized this point. It is one that must always be kept in mind by the Nation and by the several states. * * *

"Mr. Hill has rendered the Conference a real service in presenting the facts and statistics set forth in his address on land and its cultivation. Few of us, probably, were conscious of the impairment of the crop value of our soil. I am sure that a clear understanding of this subject will lead to a still further enlargement of the work of the Department of Agriculture and to still closer co-operation between the Department of Agriculture and the States in teaching economical methods of agriculture. (Applause.) Already the rapid growth of the agricultural college offers encouragment and I am glad to express my appreciation of the vaiuable work done by Secretary Wilson and his associates in bringing to our country fruits, plants and grasses suited to the different parts of our country. As the farmer pays more than his share of the taxes and receives less than his share of the direct benefits which flow from national appropriations, it is only justice to him that we shall be liberal in the support of every effort put forth for the improvement of agriculture. (Applause.) * * *

"Just a word in conclusion about an investment in permanent improvements. Money spent in care for the life and health of the people, in protecting the soil from erosion and from exhaustion, in preventing waste in the use of minerals of limited supply, in the reclamation of deserts and swamps, and in the preservation of forests still remaining and the planting of denuded tracts—money invested in these and in the development of waterways and in the deepening of harbors is an investment yielding an annual return. If any of these expenditures fail to bring a return at once the money expended is like a bequest to those who come after us, and as the parent lives for his child as well as for himself, so the good citizen provides for the future as well as for the present. This gathering will be remembered by future generations because they as well as ourselves will be recipients of the benefits which will flow from this Conferenee. We have all been strengthened by communion together: our vision has been enlarged and the enthusiasm here aroused will permeate every state and every community." (Great applause.)

Concerning the Country Life Commission.

Says the Progressive Farmer, (Raleigh, N. C.):

"Our conviction is that the Commission will accomplish untold good by directing the attention not only of the national Government, but of our own home people to the pressing needs of rural life and the possibilities or rural development. . . . It is high time, anyhow, for the South to get over this morbid and babyish sensitiveness about the publication of every statistical fact that doesn't please our passing fancy. The bald truth is that our death-rate from typhoid fever and other preventable diseases is shockingly and inexcusably high, a burning shame to our people amounting to nothing less that a sectional crime, and it is folly to deny it. The true Southerner, the man we ought to honor and follow, is the man who looks an unpleasant fact squarely in the face and sets about getting a remedy. In heaven's name, let's have done with our

quack, popularity-hunting doctors and leaders who tell us there is nothing the matter with us, that we are the greatest and happiest people on earth, and that all we need to do is to keep on forever in our old ruts of illiteracy, undeveloped resources, and out of date farming methods. Let us rather follow the doctor and the leader who loves the South with all his heart, but who loves her too well not to use the knife of criticism and reform upon the cancers upon her economic life and general well-being."

The Southern Agriculturist (Nashville) remarks:

"It is a hard thing to say, at this Christmastide, but the general impression left on my mind is that farm life in Tennessee is sordid and unlovely.

"It is true that there are beautiful country homes here and everywhere, and every home is beautiful, be it a cottage or palace, poor or rich, if to the visitor it expresses ideas of coziness and comfort.

"But as the procession of country homes pass in review before my mind, it is rarely that such a one presents itself.

"Many farms of two hundred acres or more have houses not only devoid of beauty, but devoid of the common comforts of life.

"I have known intimately the home life of the average mechanic in cities, and I am confident that if a full comparison could be made between the homes of the mechanics of Nashville, or Memphis, or Knoxville, who make $3.00 per day, and the homes of the farmers of Tennessee owning two hundred acres of land, that the former would be found better furnished and their families better clothed, and better supplied with books, and rational means of amusement; in fact that the family of the average skilled mechanic is better cared for than the average well-to-do farmer. And the comparison is utterly unfair to the mechanic, because such a farmer has an invested capital of from five thousand dollars up, while the mechanic has only the work of his hands.

"I have been in farm homes whose owner had money in bank, besides the ownership of four hundred acres of river-bottom land, and the house was bare of the most ordinary comforts—no carpets, splint-bottom chairs, benches to sit on at table, and other things to correspond. All the money in all the banks of Tennessee could not compensate for such cheerlessness.

"Is it strange that young countrymen regard any sort of work in town a deliverance from such surroundings?

"President Roosevelt's Commission on Country Life held a notable hearing in Knoxville recently, at which many valuable suggestions were made. We were told to improve our country roads, to teach agriculture in our rural schools, to safeguard the health of the community by improving the sanitary conditions of farms.

"And all these things are highly important in the bettering of country life.

"But to me the most vital need of the farm family is comfort in the home—better furniture, better clothes, more books and papers, good pictures—and this does not mean expensive ones.

"In a word let us drive the sordid and the ugly out of our farm homes and let us make of them cozy places where men and women and boys and girls may live happily."

AGRICULTURAL EDUCATION.

Agriculture in the High School.

IV. The Laboratory

So much has been said in previous discussion on the laboratory work in science and agriculture as to leave this portion mainly an enumeration of details, apparatus and supplies. For what is considered good pedagogical reasons the use of one large room for both laboratory and recitation purposes is recommended for the average school. Besides the influence which the presence of the demonstration before the pupil may have in preventing class exercises and reviews from becoming mere recitations of the words of the text book, there is the added advantage of destroying the artificial barriers so often built between the natural sciences. The use of agricultural materials especially will aid in unifying science. For recitation use the recitation end of the science room should have seats with writing arms, a blackboard, and instructor's desk, maps, charts, and the agricultural library case. The other end of the room should have a sink with two taps, a cupboard similar to the accompanying cut Fig. 4 which is made of pine and stained dark at a cost of $26.00, gas connections if possible, three kitchen tables, vertical and cross beams between floor and ceiling and wall shelves as shown in Fig 5.

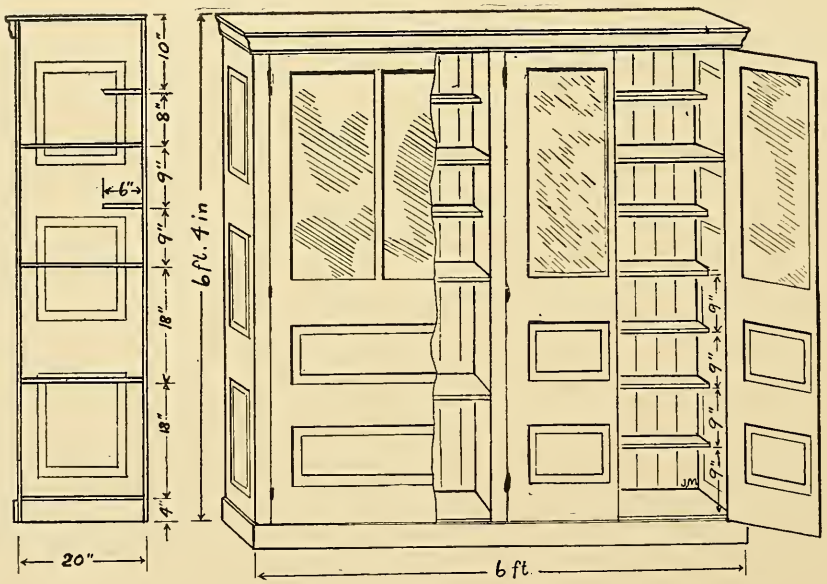

Fig. 4.

Where gas may be afforded it should be provided, otherwise alcohol and gasoline should be used. The list of chemical apparatus which follows provides both kinds, but contemplates the omission of such as is not needed, depending on whether or not gas is available.

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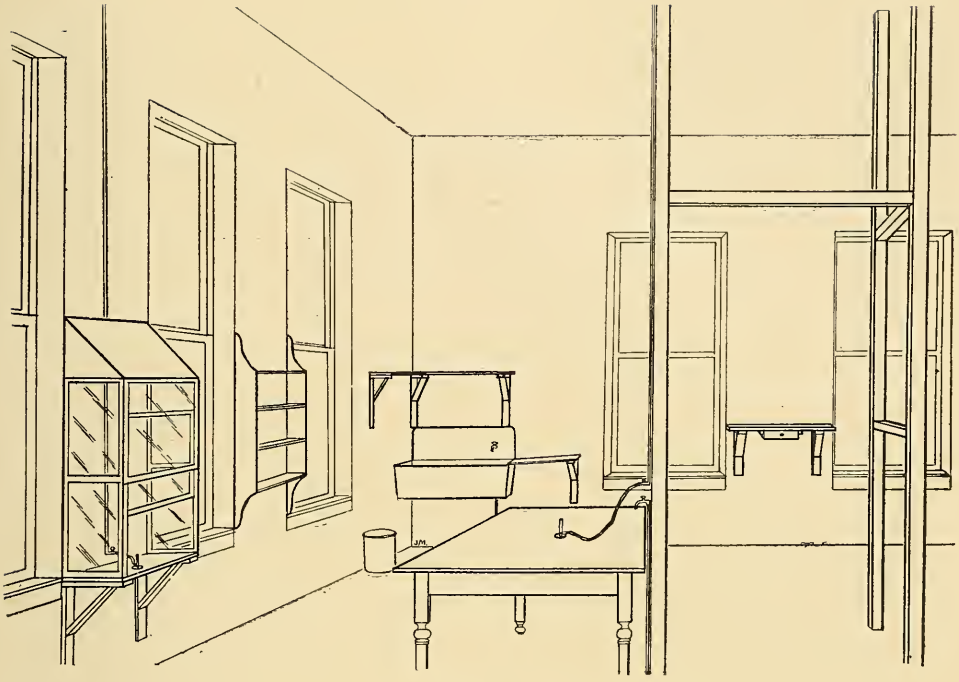

Fig. 5.

These shelves consist of (a.) an open cupboard for chemical reagents, (b.) a shelf above the sink, (c.) a draining board at end of sink, (d.) a wall shelf for fine scales with drawer for weights, and (e.) a hood for ignition, connected with a chimney flue. These shelves may be made of oak at the following cost: (a.) $3.00; (b.) $2.50; (c.) $1.50; (d.) $2.00; (e.) $7.00.

In selection of the preceding and following articles of equipment regard was constantly had for a maximum beyond which the average high school may not be able to go. And to save expense of unnecessary duplication of apparatus prices are omitted from such articles as may be provided elsewhere in the list. Thus beginning with "chemicals," "chemical apparatus" and "glassware" in order the list is made complete but such articles as occur therein that are needed in other sciences are enumerated in the group where needed but with reference to the previous group where provided and with the intention of providing them in but one list. The prices set opposite the various articles are taken from bills supplied by two different firms and from a school supply catalogue and a general merchandise catalogue.

CHEMICALS

Quantity	Article	Price
4 lbs.	sulphuric acid c. p.	.75
6 "	hydrochloric acid c. p.	.85
7 "	nitric acid c. p.	1.10
2 "	acetic acid glacial	1.02

1	"	oxalic acid commercial	.12
4	"	ammonium hydrate	.76
1	"	" chloride	.34
2	"	" nitrate	.90
1	"	" alum	.08
1	"	potassium alum	.08
2	"	" hydrate	.60
1	"	" carbonate (pearl ash)	.15
2	"	" sulphate crystals	.30
2	oz.	" iodide cryst., pure	.60
1	lb.	" nitrate c. p.	.37
1	"	" chloride c. p.	.37
1	"	" permanganate c. p.	.70
2	"	" chlorate, cryst.	.30
¼	oz.	potassium	.45
8	"	sodium	.70
2	lbs.	" carbonate cryst.	.25
3	"	" hydroxide sticks	.75
2	"	" nitrate c. p.	.60
2	"	" chloride	.10
1	"	" sulphate	.10
1	"	" sulphite crystal	.10
3	"	calcium chloride, anhydrous, fused	.60
1	"	" fluoride	.10
1	"	" sulphate, gypsum	.10
5	"	" sulphate, plaster paris	.15
3	"	" oxide, quicklime	.30
5	"	" carbonate, marble chips	.25
1	"	magnesium sulphate c. p.	.34
1	oz.	" ribbon	.60
1	lb.	ferrous sulphide	.10
4	oz.	ferric chloride	.15
5	lbs.	" sulphide	.35
2	"	iron filings	.10
1	"	copper foil	.90
8	oz.	" nitrate	.25
8	"	" oxide	.35
5	lbs.	" sulphate	.50
2	"	barium chloride crystals	.25
½	"	" peroxide	.35
1	"	lead nitrate	.18
1	"	" peroxide	.36
1	"	red lead	.12
6	"	mercury	4.80
3	oz.	red oxide of mercury	.30
4	"	mercuric oxide	.40
½	"	silver foil	.60
1	"	" nitrate	.50
1	lb.	carbon bisulphide	.20
5	"	manganese dioxide 95 per cent.	.25
1	"	granulated tin	.60
½	"	antimony powdered	.25
1	oz.	strontium chloride	.10
1	"	bismuth	.30
2	"	iodine crystals pure	.75
1	"	red phosphorus	.15
8	"	yellow phosphorus	.50
1	lb.	borax	.18
2	"	zinc granules	.32
1	"	flowers of sulphur	.08
5	"	roll sulphur	.25
1	"	bleaching powder	.10
1	oz.	litmus	.10
1	"	phenolphthalein	
2	"	cochineal	.16

½	gal.	alcohol wood	.50
½	"	" ethyl, 95 per cent.	1.50
2	"	" denatured	1.50
2	"	" gasoline	.40
1	lb.	corn starch	.10
2	"	cane sugar	.20
2	"	bone black	.15
1	"	rosin	.10
1	"	paraffin	.15
1	"	tallow	.15
1	"	beeswax	.65

CHEMICAL APPARATUS

2		Bunsen burners	.66
		gasoline burner, see "agriculture"	
4		spirit lamps, 4 oz., side tubulation	1.20
		asbestos mat, 24 x 18 x 3-16	.66
		wing tip for Bunsen burner	.18
		desiccator, 6 inch with porcelain bottom	1.00
1	nest	Hessian crucibles, large 5's	.18
1	doz.	Royal Berlin crucibles with covers, 41 m m	2.00
8		pipe stem triangles, No. 4	.50
1	pair	brass crucible tongs, 9 inch	.48
2		tripods for spirit lamp	.50
2		pieces wire gauze, 5 x 5 inches	.30
		copper retort, 2 pints	2.85
2	pair	test tube holders, brass	.22
		platinum wire, 4 inch, No. 26	.30
		blowpipe	.20
		deflagration spoon, 12 m m	.11
		sand bath, 6 inch	.22
2		iron ring stands, 3 rings each	1.10
8		porcelain evaporating dishes, No. 7, 3½ inch	1.20
1	pair	steel forceps 6 inch	.15
		balance, "Kistler" 1 cg. to 100 g	12.00
1	set	brass weights in block, 1 cg to 100 g	1.35
1	pair	brass forceps	.16
2		test tube racks for 24 test tubes	.80
3		test tube brushes, with sponge	.25
3		test tube brushes, small	.12
		lead dish, 3 inch	.22
		mortar and pestle, Wedgewood 3 in.	.44
2		wash bottles, complete, stopper and tubes, 24 oz.	1.00
3		gas generating bottles, complete	1.50
2		calcium chloride tubes, 150 m m	.24
2		funnel stands, 4 holes each	1.30
		pneumatic trough	1.10
6		chemical thermometers, 10° to 110° c.	4.20
2		chemical thermometers, 20 to 200	2.00
2		earthenware slop jars, 3 gal.	.60
½	lb.	asbestos wool	.20
4	oz.	glass wool, fine	1.36
		drying oven, (at tinners)	3.50
		horn scoop, 3 x 3½	.22
		horn spoon, 6 inch	.18
		piece magnetized clock spring, 6 inch	.10
2		Mohr's clamps, small	.22
2		Mohr's clamps, medium	.30
2		Hoffman's pinch cocks	.44
		triangular file, rattail file	.25
4	sheets	litmus paper, red and blue	.32
8	pkgs.	filter paper, 600 4 inch, 200 6 inch	1.00
17	doz.	corks regular length as follows: one doz, each Nos. 3 to 16 and 18 and 20	2.54
1	set	cork borers 1-6	.80
		rubber tubing and rubber stoppers see "el. phys."	
		dropper bottles see "biology"	

GLASSWARE

2	doz.	test tubes of each following sizes: 5x8, .50, 6x3-4. .56, 7x7-8. .80	1.86
6	nests	beakers 1 to 4	2.10
3		flasks each 8 oz. and 16 oz.	1.02
4		erlenmeyer flasks 6 oz.	.72
4		thistle tube funnels	.27
½	doz.	funnels 60° 2½ inches	.54
2		funnels each 3 inch, 4 inch, 6 inch	1.52
6	lbs.	glass tubing, 3 ft. long assorted following sizes: 3-16, 1-4, 5-16	2.40
4		watchglasses, 3½ in.	.37
2		retorts, 8 oz. with receivers	.74
1	doz.	square blue glass, 3 x 3	.91
1	"	stirring rods	.16
2		burettes 50 c. c.	2.20
		pipette 25 c. c. volumetric	.25
		pipette, Mohr's 10 c. c. graduated	.40
½	doz.	cylindrical graduates 100 c. c.	2.40
4	"	cylindrical graduates, 25 c. c.	1.20
1	doz.	each bottles wide mouth, "prescription" 32 oz., 8 oz., 4 oz.	2.35
1	"	each bottles "tincture" mushroom stopper 32 oz., 16 oz., 8 oz	4.35
1	"	bottles "salt mouth" mushroom stopper, 32 oz.	2.40

ELEMENTARY PHYSICS

		spirit level	1.25
		model lifting pump	1.65
		model force pump	2.00
1-3	"	meter sticks, brass tipped	1.40
3		lever holders	1.20
1	set	universal weights	2.00
¼	doz.	brass pulleys with hooks	1.00
1-3	"	spring scales, 1-2 to 5 lbs	1.40
		balance and weights, see "chem app."	
1	set	capillary tubes	.95
		hydrometer, paraffined stick	.25
		hydrometer see Quevenne lac. "agriculture"	
		hydrometer jar 15 x 2½	.40
		thermometer sec "chem app."	
		3-scale thermometer, F. R. C.	.80
		hypsometer	3.00
		protractor, metal	.60
		barometer tube with bend and bulb	.55
		Boyle's law stand	2.00
		Hale's pressure gauge	.95
		glass tubes see "glassware"	
18	ft.	rubber tubing, white as follows: 12 ft. 1-4 inch, 6 ft. 3-16 inch	2.10
6	ft.	rubber tubing, red antimony 3-16 inch	.54
9		rubber stoppers as follows:	
		4 each 2 hole Nos. 7, 8, & 11	2.01
		4 each solid No. 6	.35
		1 each 2 hole No. 12	.30
4	doz.	cork stoppers, flat as follows: 1 doz. each, diameter 1 3-4, 2, 2 1-4, 2 1-2, inches	.145
		cork borers and cork stoppers, regular length see "chem. app."	
5	lbs.	sheet lead 1-16 inch	.64
		mercury, see "chemicals"	
5	lbs.	shot No. 5	.40
1	box	assorted rubber bands	.80
½	lb.	copper wire No. 18	.33
1	"	iron wire soft No. 28	.18
1		spool each silk thread, linen thread	.15

BIOLOGY

2		microscopes	70.00
2		bell glasses, 14 inch, 2 gal.	3.30
1	doz.	tripod magnifiers	4.80
		dissecting microscope	1.00
1	gross	slides, 1 oz. cover glasses	1.90
		razor	1.00
300		insect pins, 3 sizes	.39
½	doz.	dissecting sets (scalpel, scissors, forceps, 2 needles)	5.00
½	lb.	each formaldehyde, 40, ether, 75, potassium "cyanide," 45,	1.60
		wide mouth 8 oz. bottles, see "glassware"	
		carbon bisulphide and potassium permanganate, see "chemicals"	
1	doz.	granite pans, 9 x 12 shallow	4.00
1	"	medicine droppers	.45
½	"	dropper bottles, glass bulb	1.20
10		petri dishes	3.00
1	lb.	agar agar	1.00
1	"	chloroform	.75
6	oz.	benzole	.50
6	"	glycerine	.20
8	"	rochelle salts	.10
2		battery jars, 9 x 12, 2 gal.	2.00
½	doz.	battery jars, 6 x 8, 1 gal.	2.00
½	"	specie jars, gal.	2.52
1	"	window glass, 10 x 10	1.00
½	"	lantern globes	1.00
¼	lb.	assorted rubber bands	.80
2	boxes	gummed labels, 2 sizes	.25
		silk thread, linen thread, flat corks, rubber tubing, rubber stoppers, see "el. phys."	
		thistle tubes, cork corers, see "chem. app."	
		mosquito bar, white, see "agriculture"	

AGRICULTURE

		bucket spray, "Success"	7.00
		extension rod, 8 ft.	2.50
		extension hose, 15 ft.	1.50
		nozzles, conical, "Vermorel".50 and "Mistry" 1.00	1.50
		nozzle, flat, "Bordeaux"	.35
		pruning saw, adjustable	1.25
		pole attachment for adjustable saw	.75
		pruning shears, (grape) .50, pruning knife, .50	1.00
		pruning shears "Buckeye"	.50
		grafting chisel	.50
		mallet	.15
2	doz.	budding knives	3.60
		paris green, copper sulphate, sulfur, lime	2.00
		resin, beeswax, tallow, see "chemicals"	
		centrifuge milk tester, 8 bottles	8.00
1	doz.	milk bottles for tester	1.50
½	"	cream bottles	1.00
½	"	skimmed milk bottles	3.00
		acid measure	.15
		pipette 17.6 c. c.	.20
		Quevenne lactometer	.50
		hydrometer jar, see "element. phys."	
27	lbs.	sulphuric acid, s p. gr. 1.83	2.40
1	"	corrosive sublimate tablets	1.25
		soil auger	2.00
		iron mortar, ½ gal. and pestle	1.00
1	doz.	sealing jars, "Lightning" quart	1.65
1	"	sealing jars, "Lightning" pint	1.50

½	"	soil capillarity tubes, glass 5 ft. x 1 1-4 inch	3.00
		drying oven 100° C., crucibles, desiccator, slop jars, Bunsen vapor lamp, thermometers, brass tongs, balance, see "chem. app."	
2		percolators, qt.	1.00
		small tin grocers' scoop	.10
		cylindrical graduates see "glassware"	
		coarse balance (grocers') with weights ½ oz. to 4 lbs.	3.00
½	doz.	small granite pans, circular	.90
		iron pans and troughs (at tinners)	3.00
		sand, sawdust, muslin, cheesecloth, mosquito net, cotton thread	1.00
		specie jars, see "biology"	
		shot, spirit level, see "el. phys."	
1	set	sample soils 28	1.50
1	"	economic seeds	1.50
1	"	weed seeds	1.50
1	doz.	smooth dinner plates	1.20
1	gross	vials, 2 drachm .85, stoppers .15	1.00
1	set	brass gauze sieves, 5 sizes	5.50
1	doz.	tripod magnifiers, see "biology"	
2	"	flower pots, 3-4 gal. with saucers	1.70
		steel tape 50 ft.	2.50
		muriate of potash, acid phosphate, ground rock phosphate, bone meal, lime, limestone	5.00
		magnesium sulfate, potassium sulfate, ammonium sulfate, ferric chloride, see "chemicals"	

TOOLS

		hollow handle tool	1.12
		vise, small	.75
		hatchet	.50
		saw	1.30
		brace and bits	1.00
		square	.30
		combined pliers and wire cutters	.85
		pincers, small	.25
		whetstone	.45
1	lb.	each iron wire, No. 24 and No. 18	.35

PLANS AND PURPOSES OF A NEW FORM OF COLLEGE EXTENSION WORK.

One who has followed agricultural progress and the part played therein by the U. S. Department of Agriculture and the state agricultural colleges knows that the present problem is to get the knowledge which has uccumulated into a practicable and accepted form for the most conservative as well as the most numerous portion of our population—the farming classes of the present and coming generations. But while this great problem of agricultural instruction is well recognized all over the land, another phase of the subject not less important is not so widely recognized, namely, that agricultural education promises perhaps more for the advancement of education than for the advancement of agriculture merely. And the fact that it is not so recognized leaves the propaganda in the hands of the agriculturist rather than in the hands of schoolmen for its pedagogical organization. As a school subject the pedagogy of agriculture has not been worked out.

Training in agriculture having been classified as a division of the more general subject of industrial education comes quite naturally to be regarded by schoolmen, trained along the accustomed scholastic lines,

as being on a parity with manual training which is rapidly finding a place in our educational system. But this conception of the place or function of agriculture in the curriculum is wholly inadequate. For while manual training, aside from its general cultural value in the schools, aims only to train for a vocation, agriculture, aside from its cultural value for the student of whatever future calling, must, in its purely practical aspect include a great deal more than a vacation. It is not only a business but a mode of life and no preparation for that mode of life could be complete that does not include not only farm husbandry, or agriculture in its strictest sense, but also much of the manual training peculiar to rural pursuits, hygiene and agricultural economics and even rural society, education, and general culture. Where the skilled mechanic or engineer of the city has his amusements, avocations, and daily interests aside from his profession, provided by sports, theatres, libraries, lectures, art galleries, parks, clubs, and business intimacies, the farmer must provide not only his living but to a large extent all those things which make life worth living.

Were it possible to treat agricultural education in our schools as we deal with manual training, the task of apportioning so many hours per week to the subject or of establishing separate schools for the more intensive training of those who elect it as a vocation, would be relatively simple so far as outlining courses is concerned. But as we see, citizenship of the highest type and not simply agricultural skill should be the practical goal of agricultural education, disregarding of the cultural value such early training may have in fitting for any calling in later years. This ideal of education for the children of rural communities can thus readily be seen to be far reaching and to involve some deep seated changes not so much of the subjects to be taught as of the point of view from which to present them. The teacher will consider that while her pupils are living in a rural environment they should be taught how to make the most of that environment, be the time long or, short.

Nor is the need of utilizing the child's environment in his education limited to the elementary schools. The teaching by parable—in which familiar objects and experiences are utilized to illustrate the principle taught—is as old as scripture and is founded on safe pedagogical principles. And so the high school teacher whose pupils come from rural homes is neglecting the most valuable part of their knowledge when he fails to draw upon their farm experiences in the teaching of technical subjects.

This conception of the place of agriculture in the elementary and high schools is given to explain the motive which prompts the University of Tennessee in the inauguration of a new line of agricultural instruction which is to be begun this month in cooperation with the county high schools of the State, through its Department of Agricultural Education. This department, it will be noted, is not in the College of Agriculture

but the College of Liberal Arts and it purposes not to lead students from rural schools to the College of Agriculture more than would any other general educational cause, but to aid in the inauguration in the county high schools, of work now to be had only in the agricultural colleges of the land, and is in response to a demand of the high schools for such work. It merely means utilization in the child's education of the things most familiar to him, leaving it to each individual to decide whether he shall make a practical application of this training as a farmer or accept only the cultural value which all may get from such utilization.

The work now being offered will consist of a course running to the end of the school year to be in the hands of the regular high school faculty and given a place on the school program as definitely established as the other high school subjects. The part of the State University will be to send the professor of agricultural education each month to each of the schools maintaining the course, to give a lesson and demonstration, to outline the work and suggest readings and reviews. Each lesson in turn will presuppose the mastering of all former lessons thus making the work cumulative and capable of increasing technicality.

Heretofore agricultural extension has been on a very different plan. To quote from John Hamilton, Farmers' Institute Specialist of the U. S. Department of Agriculture, the farmers' institute has been adult instruction of experienced farmers and has suffered from there having been "too little time devoted to instruction in each locality" and "too little work done by the scholars." The work has been of value chiefly in giving a desire for more and better instruction and the present plan is to satisfy that demand as voiced by those communities which desire the work in a better organized form through the medium of their schools. It has the advantage of regularity and progressive development, thus starting from the more elementary principles and gradually assuming a more scientific aspect. The importance of instructing youth rather than adults, of meeting the same audience on each successive visit, and of utilizing the government, equipment, and studious atmosphere of the established schools is also apparent. The following conditions are suggested to the schools desiring this work and which have not already a trained agriculturist on their teaching staffs.

Each school will be asked to assume the responsibility for success of the work; to provide it a regular place on the program; to assign the class to a member of the faculty who will attend to demonstrations which require some time for their operation, will see that the class does the assigned readings and reviews and keeps notes of all instruction other than assigned readings; to plan a continuation of the course from year to year so long as the University offers cooperation and, finally; to maintain the work independent of this direct University connection as soon as finances of the school will permit and other conditions seem to justify it.

The expense to the school will be anything from a minimum of about ten dollars up to whatever seems best for equipment which in no case

will be very much for purely agricultural supplies, and will not include any pay to the lecturer other than such entertainment as the locality may wish to provide at the monthly visit. It is realized that the success of this work will not depend upon the amount of money paid but upon the spirit of the school and the backing of its faculty, officers, and patrons, and hence the promoters would regret to have any school undertaking the work think its obligation discharged by the payment of expenses however large, as the work should be on a different plane. It is desired also to insist on a distinction being made between such popular lectures as the instructor may be asked to give outside his class work on the occasion of his visit and the class work itself. For in the former case the speaker feels it incumbent upon himself to be entertaining and the attitude of the audience is passive while the class work would fall short of its prime purpose if it deprived the student of the exercise of his own activities and failed to subordinate entertainment to what the instructor may at times consider greater needs of the class.

KEEPING BOYS ON THE FARM.

By Morris K. Gordon, Kennebec Co. Me.

I saw in a paper a little while ago the question, "How can we keep our boys at home on the farm?" In one way this is a hard question to answer, in another it is not. Let me give a boy's idea on the question.

In all people there is a born desire to become something when older. Now in dealing with the farmer and his boys, their desire will be to follow in their father's footsteps, if he is a successful farmer; but if that boy never has a chance the desire will soon burn away and another will quickly take its place. I believe that every boy should have a chance, a chance to see what he can do as a farmer all alone by himself. I believe that the father should give his boys a chance to keep that kind of stock which they are most interested in, for they will do best with that which interests them most; also that he should allow the boy to grow something to sell to buy feed with. I believe that the father should influence his boy to keep account of everything he buys and sells so at the end of each year he may be able to find out whether he has lost or gained in his work. I believe also that the father should not interfere in any way more than to give the boy good advice, for a lesson learned when young is worth two learned when a man.

If all fathers would do this by their boys and cheer them when they get discouraged and also influence and help their sons to attend the two years' agricultural course which state universities provide, then more of our boys will stay on the farm and there will be better farms, also better methods of farming in the future.

Do not make the boys work all the time, but give them a day or two off to do as they are a mind to, but still teach them how to work and also teach them to be able to work for themselves. Remember that the boy of today must have a better education to go through life successfully that the lad of forty years ago.—From the Breeder's Gazette of Dec. 23, 1908.

WHY DO BOYS LEAVE THE HIGH SCHOOL?

Dr. William Lee Howard.

The question, "Why Do Boys Leave the High School?" is frequently seen in educational journals. The answer is plain to a man of the world. Because the boys realize that something is wrong; because no real boy is going to sit quietly and be told every day that his girl classmates are going ahead of him in his—or, in reality, their—studies.

Of course they are. A young woman of seventeen is quite a different proposition from a boy of the same age. The boy knows that he is not being adjusted to fit somewhere in life; knows that all his teacher cares about him is his showing in the reports. He must come up to a certain standard in all subjects, no matter how unfit he is mentally and temperamentally to master some of them. In other subjects he knows he could excel. But his inclinations mean nothing to his automatic teacher. It does to the boy; he realizes that unless he is adjusted to his capabilities he will be a failure in life. He can never pass that examination in Roman history, French, or drawing; he knows it; he also feels that for him it is a waste of time to fool any more. So he leaves the high school, and is probably told by his father that as long as he would not stay in school he can hustle for himself. Then is thrown upon the land another untrained boy; a disheartened youth who, as a man, is to be a failure.—From the November American Magazine.

THE APPLE TREE.

On studying the apple tree we find that there are a great many things to be learned about its life and growth.

In the early spring the bud pushes off the scales, which protected it during the winter and begins to grow. They grow very fast if the season is favorable and the spaces between the buds, or internodes, are very lengthly. But if instead of being favorable we have several dry spells, some of the spaces between the buds will be very short and others long.

You can tell the age of any part of the tree by counting the rings in the wood and you can tell how old any twig is by the rings which were left when the scales fell off.

If the tree has put forth fruit buds, further growth will be stopped, that is,the fruit spur will stop growing and all the food will be stored up for the production of flowers and fruit. As a rule a fruit spur produces flowers and fruit every other year, and other years it simply grows. You can tell by looking at the fruit stem whether or not the apple got ripe. If the apple got ripe there will be a large scar, if not the scar will be small.

Some of the buds form leaves which digest the food that is used in the tree. They also remove the wastes from the tree.

When you prune a tree you should begin at the top and prune it so that the sunlight can reach all parts, so that all the fruit may be fully developed.

Carrie Stinecipher

Grandview Institute, Dec., 1908.

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USEFUL AND FINE ARTS.

Beauty must come back to the useful arts, and the distinction between the fine and the useful arts be forgotten. If history were truly told, if life were nobly spent, it would be no longer easy or possible to distinguish the one from the other. In nature, all is useful, all is beautiful. It is therefore beautiful because it is alive, moving, reproductive; it is therefore beautiful because it is symmetrical and fair. Beauty will not come at the call of a legislature, nor will it repeat in England or America its history in Greece. It will come, as always, unannounced, and spring up between the feet of brave and earnest men. It is in vain that we look for genius to reiterate its miracles in the old arts; it is its instinct to find beauty and holiness in new and necessary facts, in the field and roadside, in the shop and mill. * * * * Is not the selfish and even cruel aspect which belong to our great mechanical works * *. the effect of the mercenary impulses which these works obey? * * * * When science is learned in love, and its powers are wielded by love, they will appear the supplements and continuations of the material creation.—Emerson.

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BACTERIA IN MILK.

The following is an attempt to set forth in a brief, unscientific way the more salient known fact concerning the role of bacteria in milk from the economic point of view, both of the producer and consumer. I shall make no attempt here to discuss the organisms found in milk, which are capable of producing various forms of disease as it would take us beyond the desired limit of this publication. Suffice it to say that typhoid fever, tuberculosis, diptheria and scarlet fever are the most prevalent and at the same time the most dangerous forms of disease communicated by milk to man.

Bacteria.

Bacteria are single celled plants which are ever present in air, water and earth and are ready at all times to find lodgment in any substance which will form a suitable nourishing medium for their growth and activity. Milk is one of the best known of such substances and it should constantly be kept in mind by the milkman that these germs are constantly present over his pail ready to fall in and begin processes which may lead to his extensive loss if he wishes to market his milk sweet. It should also be remembered that dust is especially efficient in aiding bacteria in getting a good distribution. They cling to the particles of dust and dirt of every kind and the air carries them about and drops them everywhere. This is especially true if the air is in considerable motion. Moist or wet surfaces and quiet air are calculated to prevent distribution of bacteria as they will not leave such surfaces or move in quiet air.

If it is intended to deliver the milk sweet, the fewer bacteria it contains the better as the keeping qualities depend directly upon the quantity and quality of the micro-organisms it contains. Milk free from bacteria would never sour; therefore the fewer you can have the longer it will remain sweet. Not much can be ascertained, however, as to the cleanliness of the milk by a mere knowledge of the number of bacteria it contains except the age of the milk is also known, for dirty new milk will probably have fewer germs than clean old milk. In general milk not more than ten hours old should not contain more than fifty to one hundred thousand per cubic centimeter. A higher count indicates bad handling.

Sources of Contamination.

In the normal condition the milk in the udder is nearly or quite free from bacteria and whatever organisms are found in it thereafter are attributable to outside sources; so that the manner of drawing and handling the milk determines its bacterial content up to the period at which those present begin to multiply. It should be observed in this connection, however, that in the outer end of the teat some germs will always be found living in the small amount of milk left at the last milking, so that the fore milk should always be discarded or kept separate from the remainder.

There are serveral sources from which bacteria may find their way into milk after it is drawn, but the more common are the cow, the milker and the vessels in which it is recived.

If the cow is not properly cared for there is always more or less filth and dust particles adhering to the flank, belly and hind quarters which are readily dislodged and drop into the pail with their accompanying bacteria. This dirt is usually composed partly of the offal from the animal and contains a great number of germs of various types. This source of contamination may readily be overcome by proper attention to the care of the cow. Good bedding with the proper brushing will aid greatly in keeping the bacterial count low. The use of a small amount of water applied to the parts of the animal adjoining the udder will be found very effective.

Often the milker is at the same time feeder and barn attendant and without proper precaution goes from one task to the other, thus carrying many bacteria into the milk while drawing it. Dust clinging to his hands and clothing readily drops into the vessels and adds greatly to the bacteria of the milk. A change of clothing and careful washing of the hands and face should always come between the feeding, barn cleaning, etc., and the milking. Any carelessness about cleanliness of person on the part of the milker adds its own share to the bacterial contents of the milk.

The vessels for receiving the milk are often the most fruitful source of bacteria in milk; particularly the lactic acid organisms which are especially responsible for its souring. Vessels in which milk has once been allowed to sour invariably contain these acid producing bacteria and if not thoroughly washed and sterilized will increase enormously the number of germs. Irregular surfaces, due to seams battering, etc., should receive especial attention as they form excellent hiding places for bacteria. If the pail becomes much battered it should be used for some purpose other than containing milk. Thorough scalding of all articles with which the milk comes in contact is indispensable. It should be borne in mind that direct sunlight is an excellent germ destroyer and the vessels should, therefore, be given a thorough sunning whenever possible.

Bacterial Growth.

The number of bacteria in milk when fresh is of far less consequence than the opportunity they are given to multiply. Given a favorable opportunity the progeny of a single bacterium would easily cause the souring of a can of milk in from eighteen to twenty-four hours, for the rate of increase is extremely rapid. There are four rather definite bacterial periods, so to speak, in milk, after it is drawn. First the "germicidal period," which lasts two to four hours, during which time the bacterial content is not increased and in fact usually shows a distinct decrease. There appears to be in the milk a substance having a germicidal effect and not only inhibits the growth but actually kills some forms of bacteria. This period affords the dairyman ample time to properly care for his product before germ multiplication begins. Second period. During this period there is a rapid multiplication of all types of germs present if the temperature is favorable and there is little gaining of ascendancy of one type over the others. This increase lasts from ten to twelve hours and is then succeeded by the third phase or period.

The third period is characterized by the gaining of decided supremacy of the lactic acid bacteria over all competing forms. It begins usually after the number has reached about ten million per cubic centimeter. This lactic acid organism is the milk sourer par excellence and the acid produced by it soon clears the field of all rivals and holds it until the milk is thoroughly curded and the quantity of acid becomes so great that it can no longer thrive in its own excretions. When the milk is thoroughly sour it will contain practically a pure culture of this acid bacterium.

The fourth period is marked by the cessation of bacterial activity and there is soon a decided reduction of numbers. This condition may last for several days but sooner or later the extreme acid condition is sure to be reduced by the growth of molds, etc., which can thrive well in an acid medium. The growth of molds produces an alkaline condition in the curded milk which in turn favors bacterial growth and the entire mass of curd will soon be broken up by various proteolitic forms.

The lactic acid bacteria are at once the friend and foe of dairymen. If it is desired to sell sweet milk it would be better if they were out of existence, but if butter and cheese are the required product, they are indispensible.

Methods of Preventing Bacterial Multiplication.

The multiplication of bacteria when once in the milk may be prevented with greater or less success by the employment of any one of three methods, the use of two of which is not without very serious objections; especially from the standpoint of the consumer.

These means of inhibition of growth are; the maintenance of low temperature, application of various chemicals and the submission of the milk to high temperature. The first of these methods is at present

really the only safe and satisfactory way to restrict bacterial growth. All bacterial activity ceases at the freezing point and four or five degrees above this point there is practically no growth, so that milk held at this point will remain sweet for several days or even weeks, but milk more than five or six days old should be regarded with suspicion. At forty degrees Fahrenheit (40° F) bacteria grow but slightly faster than at 32° F. From 40° F. to 50° F. growth goes forward fairly well, but 60° F. to 70° F. is the optimism or most favorable temperature for the lactic acid germ and in fact for most germs found in milk, so that souring will take place very quickly at this temperature. If a temperature from 80° F. to 100° F. be maintained the outcome will be very irregular since the lactic acid organism will not grow well at this temperature and the result will be determined by other forms present. If the milkman can maintain a temperature of from 45° F. to 55° F. he may be reasonably sure of sweet milk for two or three days if his milk is clean. There are no valid objections to this means of keeping milk except where it is knowingly employed to keep dirty milk sweet. At this low temperature almost any kind of milk will not sour.

It is well known that various chemicals will inhibit the growth of all types of bacteria and if a sufficiently strong solution is employed all are killed. These substances are known as disinfectants and those which have been most employed in connection with milk, are salicylic acid, hydrogen peroxide, borax, saltpeter, boracic acid and formalin. The addition of very dilute solutions of almost any of these chemicals will prevent the souring of milk and from this standpoint alone would effectually solve the problem of milk preservation. There are, however, many insurmountable objections to this practice. Some of the above substances are extremely poisonous to the body while the others are more or less harmful to the digestive process, so that the use of any of them is probably injurious and is condemned by common consent and also by law throughout the country. There are reasons for believing that formalin in such dilution as to be quite effective in preserving milk and at the same time not be detrimental may be employed, but if its use were permitted advantage might be taken of such privilege and an excess applied.

The use of heat to free milk from bacteria has become quite general in many European countries and has been practiced quite extensively in various sections of the United States. Keeping milk at a temperature of 212° F. for fifteen to twenty minutes is sufficient for killing all bacteria except those which produce spores. All germs found in milk capable of producing disease would thus be killed for none of them are able to produce spores. Milk thus treated will remain unchanged for many days, but it is known that boiled milk has undergone radical changes chemically, so that it has very few of the original desirable qualities and is regarded as difficult of digestion. Very few persons care to use such milk, so that it finds no sale and is therefore seldom treated in this way.

The more common way in which heat is used to keep milk is what is known as pasteurization, which is simply the application of a temperature of 145° F. to 155° F. for about fifteen minutes. This temperature is chosen because it is sufficient heat to kill most of the bacteria present and will not produce serious chemical changes; it is, moreover, the thermal death point of the bacillus tuberculosis. There are probably no disease germs commonly found in milk, that will withstand such heat and in this respect is an efficient safeguard against the transmission of disease from milk. Pasteurization also kills all lactic acid bacteria and therefore prevents souring. There is much to be said both for and against this process. In the hands of honest persons who are willing to make every reasonable effort to secure clean milk and handle it in a sanitary manner, it is to be recommended, but in the hands of unscrupulous individuals, it is certainly to be condemned, as it enables them to keep dirty milk sweet and sell milk too old to be relied upon. The lactic acid bacteria being destroyed by pasteurization other forms are given an excellent opportunity, so that pasteurized sweet milk may contain many more germs than unpasteurized sour milk and the bacteria would quite likely be of a more undesirable type than in the normal milk. It is held that milk properly pasteurized has a less desirable taste than raw and also is more difficult of digestion.

It cannot be too strongly emphasized that cleanliness cannot be substituted for by any subsequent treatment of the milk. Dirt can never be boiled out nor driven out by chemical applications. Clean milk seldom needs pasteurization and dirty milk can't be made clean by it. Cleanliness first, last and all the time in milk production.—Maurice Mulvania.

REPORTS OF BULLETIN WORK.

Junior Class in Horticulture.

The Cultivation of Orchards.

There are two methods which are now advocated more strongly than any others in the treatment of orchards. (1) Clean culture during spring and early summer followed by a cover crop in the fall and winter. (2) Sod mulch. Of these two the former is more generally advocated although probably not practiced. The primary objects of cultivation are (1) to furnish plant food (2) to conserve moisture. The soil is to be regarded as the store house of plant food and in converting this into a form which plants can use nothing else offers the advantage of tillage. It is also now realized that no factor assists so much in the conservation of moisture as does tillage. Before setting the trees the soil should be in best possible condition for plant growth. If it is naturally loose, plowing well will suffice; if there is a

hard subsoil underneath, the ground should be plowed deeper or subsoiled. For the first few years in the life of the orchard the soil should be turned at first cultivation in the spring, after this the surface should be stirred at intervals of about 10 days and especially after each hard rain. Level culture in the orchard is best and this is brought about by turning the soil toward the trees one year and away the next. During the first few years the trees do not make use of all the soil between the rows hence it is possible and profitable to grow some crop between them. Any hoed crop such as potatoes, or beets may be used, however, there should be left a space on each side of the trees of several feet. In order that the growth of wood and buds may each year reach maturity, so that they may better withstand the winter, the moisture supply should be lessened toward fall. The most practical way of doing this is by sowing a cover crop in the late summer. A further advantage in this is in the amount of humus supplied to the soil by the annual turning under of such a crop. For such purpose, rye, crimson clover and vetch are of value. Late cultivation may be very injurious by stimulating growth which has not time to reach maturity.

The grass mulch method seems under certain conditions to meet well the requirements of the soil as to moisture and vegetable fibre. It appears to be of especial value on hilly land or rough land where grass will grow. The trees are set out in sod land, disturbing only enough of the sod to provide large holes for the young trees. They are then mulched so as to keep the soil moist until they get well established and then the grass is cut and allowed to remain on the ground where it falls.—R. M. Murphy, '10.

Fertilization of Orchards.

In the production of all kinds of fruits there is always a loss of fertility to the soil. Each year, fertility is stored up in the fruit, leaves and new wood. This continual draft on the soil fertility will exhaust it unless it is restored in some way. One way to decrease this draft is to thin the crop, thereby producing fewer fruits but of a better quality. No more fertility is stored up in a large plump fruit than in dried, shriveled one. If the leaves are kept on the soil by a cover crop, some of the fertility will be restored. But the fertility stored in the new wood each year cannot be returned and therefore becomes exhausting to the soil. It has been estimated that an acre of apples, containing 35 trees, uses in the production of leaves and fruit for 20 years of full crops, about 1000 pounds of nitrogen, 160 pounds of phosphoric acid and 1,200 pounds of potash. Nitrogen, phosphorus and potash being computed at 15, 7 and 4.5 cents per pound, respectively, it amounts to $215.20. This means that five bushels of apples per tree remove each year in round numbers from one acre, 11 pounds of nitrogen, one pound of phosphoric acid and 16 pounds of potash, and that the leaves large enough to produce the apples would contain 10 pounds of nitrogen, 3 pounds of phosphoric acid and 10 pounds of potash or a total of 21 pounds of nitrogen, 4 pounds of phosphoric acid and 26 pounds of potash.

The best method of keeping up the fertility under such conditions is the application of commercial fertilizers on a cover crop which is to be turned under in April. During the summer, after every heavy rain, the land should be harrowed to save the moisture. About the middle of July or the first of August, the orchard can be seeded to some cover crop such as crimson clover, rye or winter oats. In April the commercial fertilizers should be applied broadcast on the cover crop and the cover crop turned under, Special care should be given not to plow the land the same way every year. The results from an experiment carried on in New York State show that the application of phosphorus and potash to an orchard has no effect on the yield of apples. This experiment was carried on for 12 years on a 50 year old orchard and at the end of 12 years those trees that had no application of phosphorus and potash yielded as high as those that had received a large application of both food elements each year. One would think from this experiment that the application of commercial fertilizers to an apple orchard is not necessary. It was not in this orchard, but what kept the yield of fruit up in that part of the orchard which received no phosphorus and potash was the cultivation given it each year and the growing and turning under a cover crop each year. In this case cultivation was fertilizer enough for the orchard. Some soils, however, will need an application of commercial fertilizers and these elements must be applied in the most soluble form at the beginning of the growing season. Nitrate of soda, sulphate of potash and Tennessee Rock Phosphate are good commercial fertilizers for the orchard.

Cover crops play an important part in maintaining the fertility of the soil. They are divided into two classes, nitrogenous and non-nitrogenous. Alfalfa, hairy vetch, clovers, soy beans, cowpeas and Canada peas belong to the nitrogenous group, while the rapes, turnips, cereals and buckwheat belong to the non-nitrogenous group. The difficulty in obtaining a complete stand is the main objection to alfalfa and the vetches. The crimson clover is the cover crop for Tennessee. Soy beans, cowpeas, and Canada peas are not good cover crops because their growth is stopped by frost and hence the soil is not sufficiently protected in the winter. The best of the non-nitrogenous crops for Tennessee are rye, wheat and winter oats.

The needs of an orchard can be determined by the amount of wood growth each year and the size of the crop. If the yearly wood growth is very small, an application of a complete fertilizer is necessary, but if the growth is moderate and the crop of fruit sufficient, tillage alone should suffice. In apple trees fifteen years of age, three to five bushels of fruit per tree, with one foot of growth on leading branches, fills the latter condition.—G. R. Worthington '10.

Bitter Rot.

It is easily identified, having its beginning in one to many brown specks or slight discolorations under the skin of the apples. They become larger and present a circular outline. When they are about one-eighth inch in diameter they area begins to appear sunken. A great number of pustules so small as to be scarcely seen with the unaided eye cover all but the outer border of the discolored spot and gives to the surface a roughened appearance. In damp, moist weather these pustules break through the skin of the fruit and deposit a mucilaginous or waxy substance which later forms a crust. At this stage the whole fruit becomes shriveled into a hard body called a mummy.

Bitter Rot is caused by one-celled spores which exude from the pustules and are spread by the rain drops. These spores are commonly called conidia and they produce germ tubes. These tubes elongate very fast forming hyphae, which make up the fungi or bitter rot.

The disease may also be spread by insects from one point to another but as the spores are contained in a waxy substance they are not spread by the wind and further it takes water to dissolve this wax making it possible for them to be spread. Hence the disease is more prevalent in damp wet weather than any other time. Trees having had the disease are more susceptible, but a tree may be infected in one part of the orchard and the rest remain unharmed. The disease goes from tree to tree slowly in the orchard, probably through the agency of insects.

The disease is carried through the winter in the canker stage which affects the limbs and the spores are carried through in them. The bark is affected in this stage and is sometimes killed for some distances along the limb. As the bark dies it cracks and adheres very closely to the wood giving it a sunken appearance. By looking at a cross section of a cankered limb it is found that the wood is sometimes killed to the very center. The spores are spread to the fruit from these cankers and their dissemination probably begins early in summer and continues until the apples are fully grown. Another source of infection is from dried mummies hanging on the trees or lying on the ground.

The disease may be removed by picking the dried apples and burning them before the leaves fall and in no circumstances should rotten fruit be allowed to remain on the ground under the trees.

In case of canker the whole limb should be cut off below the canker and burned. Where the limb is a large one the diseased portion may be cut out without cutting off the entire limb. Spraying with fungicide such as Bordeaux mixture may help to keep the disease in check.
—Arnall Peery '10.

RELATION OF THE U. S. WEATHER BUREAU TO FARMING IN TENNESSEE.

It is the desire of the Chief of the Weather Bureau, Prof. Willis L. Moore, to cooperate in every practicable way with all who cultivate the soil. While the plans already worked out are many and have been of great benefit to the farmer the field as a whole is almost untouched. It is the purpose of this article to suggest briefly one or two ways in which the farmer in Tennessee can benefit himself by the use of the records and forecasts of the Weather Bureau.

First as to the records themselves, what are they and how are they obtained? The maximum and minimum temperatures for each day and the daily rainfall have been observed and recorded at more than fifty stations in Tennessee for periods ranging from ten to thirty-eight years. A careful record has also been kept of the last killing frost in the spring and the first killing frost in the fall.

These records are obtained from standard instruments furnished by the government by men who have been carefully instructed by Weather Bureau officials. Reports are sent to the Section Center at Nashville each month, where they are carefully compiled and published for the benefit of any who will make use of them. Unfortunately comparatively few people get benefit from these reports, probably because they do not know how to use them.

Why is a record of last killing frost in spring and first killing frost in fall of value to the farmer. It gives him a good general idea of safe dates for planting his various crops. For example, if the Weather Bureau tells him that the average date for the last killing frost in spring is April 10th, he will know that a tender crop planted earlier than that date is more likely to be killed than not, which if planted later than April 10th, the chances will be in its favor. Or if he is told that April 20th is the latest date on which a killing frost has occurred in his locality in a long series of years he may delay planting until that date and be practically free from any danger from frost.

In the same way the record of the first killing frost in the fall is also of value. A farmer who knew that the average date of the first killing frost in fall, in his locality was October 15 would know better than to sow a variety of cowpeas, that required 90 days to mature, later than July 15. If he could not get his land ready until after the middle of July he would sow something that would mature quicker.

By calculating the number of days between the average date of last killing frost in spring and the average date of first killing frost in fall we have what may be called the average growing season. A farmer who lived where the average growing season was 190 days would not think of depending upon a crop that always required 200 days in which to mature.

In the same manner records of temperature and rainfall may be of great value. For instance, if June and July were always hot and dry in a certain locality, one would not put in crops that required moist, cool weather during those months. To the farmer who wishes to try new crops or to one who has come to a new locality this data would be particularly valuable, as it would also be to one who was looking for a location in which to grow a particular crop.

In addition to these records there have been kept at several points in the State long records of sunshine, cloudiness, wind movements, wind direction, and relative humidity or the percent of moisture in the air. All these elements have an influence in crop production and the modern farmer cannot afford to overlook them. He cannot afford to plant sunshine loving crops at a time when he is almost sure the weather will be cloudy. And not only his crops but his personal comfort and the comfort of his stock is affected by the elements that go to make up the weather. His buildings should be so located that they are protected from the prevailing winds of winter. If he is in need of power he need not buy an expensive windmill in order to learn whether or not there is wind enough in his locality to run one for he can for two cents learn from the nearest Weather Bureau office just about what the average wind velocity is.

So much for the value of Weather Bureau records. Let us now consider the benefits to be obtained by the use of the Daily Weather Forecasts.

The Weather Bureau has some 200 stations distributed pretty evenly over the country. At a certain hour every morning the observer at each station takes an observation and sends it by telegraph to the Central Office. He sends in this message the pressure of the atmosphere, the temperature, the direction and velocity of the wind, the amount of rainfall, if any, and the state of the weather, whether clear, partly cloudy, or cloudy. The man who is to make the forecast enters all this data on a large map and thus has before him what we might call a picture of the weather for that morning. He can see where pressure of the atmosphere is low and where it is high. He can see where it is hot and where it is cold, where it is raining and where it is dry, where it is windy and where it is calm, where it is cloudy and where it is clear. He has before him the weather of the whole country and he can see it all just as plainly as the farmer can see the weather conditions over his farm. These maps have been made every day for more than 30 years and the forecaster has learned that all these weather conditions, dry weather and wet weather, cold weather and hot weather, windy weather and calm weather, move across the country from west to east.

He has seen hundreds of storms travel from the Pacific to the Atlantic and has become familiar with the path they usually follow. Now, when a storm or cold wave appears in the west he watches it from day to day, sees just how fast it is going, sees in what direction it is going and is

able to tell people in the path that it is coming one or two days before it reaches them. These Daily Forecasts are widely distributed by mail, through the newspapers and by the telephone. Many farmers plan their work according to the forecast and thousands of dollars worth of crops are saved in the State every year. But tens of thousands might be saved just as easily if every farmer in Tennessee would ask for the Daily Weather Forecast and profit by its warnings.—J. F. Voorhees, Local Forecaster Weather Bureau.

NEEDS OF AGRICULTURAL EDUCATION IN TENNESSEE.

A few years ago the study of agriculture was introduced into the common schools of Tennessee with the idea of educating the farmers' children in order that they might not only help the fathers but be better able to help themselves at some future time. Just how poorly we have succeeded for a decade is evident. The success or failure of agricultural education in reaching the rural districts does not rest with the subject for it is as easily taught and as interesting as it is important. The problem of agricultural education must have a solution if it is comprehensible and interesting, however, the third equation has not been added, viz: the teacher who is qualified to explain the perplexing questions that a twelve-year-old boy may ask. The teacher need not be a college graduate, and in fact the average rural teacher cannot attend college, but in the normal or high schools he should have obtained sufficient knowledge to be able to explain the general laws that control the maintenance of soil fertility and plant and animal development.

The purpose of teaching agriculture in the public schools should not be to make a farmer of every child any more than the teacher of Latin or Greek expects to make a student of literature of each pupil that recites Latin lessons. The study not only has its cultural value but it has a direct money value from the fact that it will be useful to the child who will some day be a man with a poor farm to improve or a good one to maintain.

About forty years ago the idea occurred to some man that he could educate the farmer on the farm by the promiscuous distribution of bulletins. The predominance of poor farms throughout the South does not speak success for the system in this territory. The public school is the logical place to educate the would-be farmer. The country boys and girls are not lazy or indifferent towards the study of agriculture. The greatest need in the rural school is the teacher who is able to explain the mysteries and to systematize the knowledge that they have already gained from observation and experience. The country boys and girls will continue to seek the already crowded town until such a service has been performed for them. A knowledge of animal nutrition and the selection of our common domestic plants and animals may be taught the twelve-year-old boy in a simple way as satisfactorily as history or arithmetic and this knowledge in turn will vitalize farm life and raise it to

the plane of skilled labor to such an extent that the daily round of farm tasks will no longer be drudgery but a pleasant occupation.

An agricultural course cannot be systematically planned for the entire county or state for either the grammar school or the high school, because so few teachers have had any training along the line of what to teach and how to teach it. The average rural teacher that attempts to teach agriculture is forced to remain within the bounds of two book covers for his stock of knowledge. But we, the believers in agricultural education, think we can see a better day in the future when the agricultural high school graduate will take his place as a grammar school teacher. The teacher in the next decade must be prepared to teach agriculture as well as spelling and writing, for in the study of the soil and the forces that rob it of its fertility the youth will become an efficient and trained workman.

The commercial fertilizer bill of the average farmer will almost buy bread for the family, yet how can he avoid this expense when his soil is growing poorer every year? A large percent of the consumers of commercial fertilizers never receive any increase in yield. Very few farmers know the extent of the ill effects of commercial fertilizer on the soil. The country boy here in the South must learn the value of farm-yard manure, and not only know the value, but also a way to utilize the beef and dairy cow as a machine to manufacture more manure from the thousands of tons of corn stover that are allowed annually to blow away in the wind.—V. S. Bright, '07.

AGRICULTURAL EDUCATION.

Agriculture in the High School.

V. School Grounds and Plots.

Leaving out of consideration school gardens, which concern elementary grades, and vegetable gardens, which, though valuable, are not necessary demonstrations to the high school course as herein conceived, and confining attention to those demonstrations peculiar to general agriculture and called for by the foregoing course of study we may group them into three series as follows: the first series to illustrate fertilizers and rotations, the second, forage and cover crops, and the third, desirable introductions.

Beginning with the last, **desirable introductions** will in most communities include rape, kale, sorghum, resistant clover and more especially alfalfa. These demonstration plots should be small, about 1-80 acre each except the alfalfa which should be larger. The approved method for getting a stand of alfalfa is as follows:

"Plow deep in the fall applying fertilizer at the rate of 50 lbs. muriate of potash, 300 lbs. acid phosphate and 12 tons of barnyard manure per acre. Sow to rye and vetch, turn under in the spring, apply 2,000 lbs. of lime per acre, plant soy beans, and cultivate all summer. Repeat the process for the second year. Harvest the second crop of beans and sow 30 lbs. alfalfa seed per acre by Sept. 1." (Tennessee Experiment Station.)

[Copyright 1908 by Josiah Main]

The second series demonstrates the management of crops raised mainly for **soiling** and **winter cover.** In all these combinations there are two crops per year, the winter crop being usually a combined cereal and legume which is harvested green as needed for feed and the land at once put into a summer crop of peas and beans to be harvested in the fall in time for the following winter crop. Where a variety test is made of either the winter or summer crops the crop alternating during the remainder of the year should be the same for the varieties tested. Following are some of the varieties recommended with the rate per acre in lbs.:

Winter crops: cereals; rye (60), wheat (60), oats (48). Winter crops: legumes; vetch (30), crimson clover (20), alsike (15). Summer crops: mammoth yellow soy bean, Ito san cowpea, medium yellow cowpea, early medium yellow cowpea, Jap pea, and No. 1538, each at the rate of 20 lbs. per acre.

It is recommended to consider all the varieties of cowpeas as experimental, followed by a standard winter cover crop of rye and vetch (1-4 acre) and to consider other combinations of cereal and winter legume as experimental, all followed by a standard summer crop of 1-4 acre of mammoth yellow soy beans, thus making a half acre for this series. The purpose of equalizing conditions by having the same summer crop on all comparative tests of winter varieties and of having the same winter crop on the portion devoted to summer variety tests will be apparent.

Series one, **rotation and fertilizers,** is a very important demonstration and requires exactness in its preparation and care. A test of different kinds and combinations of fertilizers demands the use of definite quantities,the continuity of the demonstration through a number of seasons—the result getting to be more apparent and valuable the longer it runs—and a uniformity in size of plots. And it is essential first of all that the area devoted to the test be uniform in character throughout that difference in results on different plots may be attributed wholly to the character of fertilizer. The plan shown in Fig. 6 and the accompanying explanatory notes show how this exactness is to be attained and one of the ranges shows the plan of applying fertilizers.

Considered as a rotation demonstration, series one is intended to show simultaneously the four annual phases of a four year rotation as they would appear June 1 of any year. The crops selected are such as prevail all over the state and are worthy of recommendation. Their order of succession on each range is as follows: 1st year, cowpeas, 2nd year, wheat, 3rd year, clover and grass, and 4th year, corn. The cowpeas are sown in the spring and disposed of in time to prepare range for wheat. With the wheat is sown red clover or alsike and in the spring any suitable grass seed may be added as desired. This clover and grass is then let run until the second spring after wheat is harvested. The

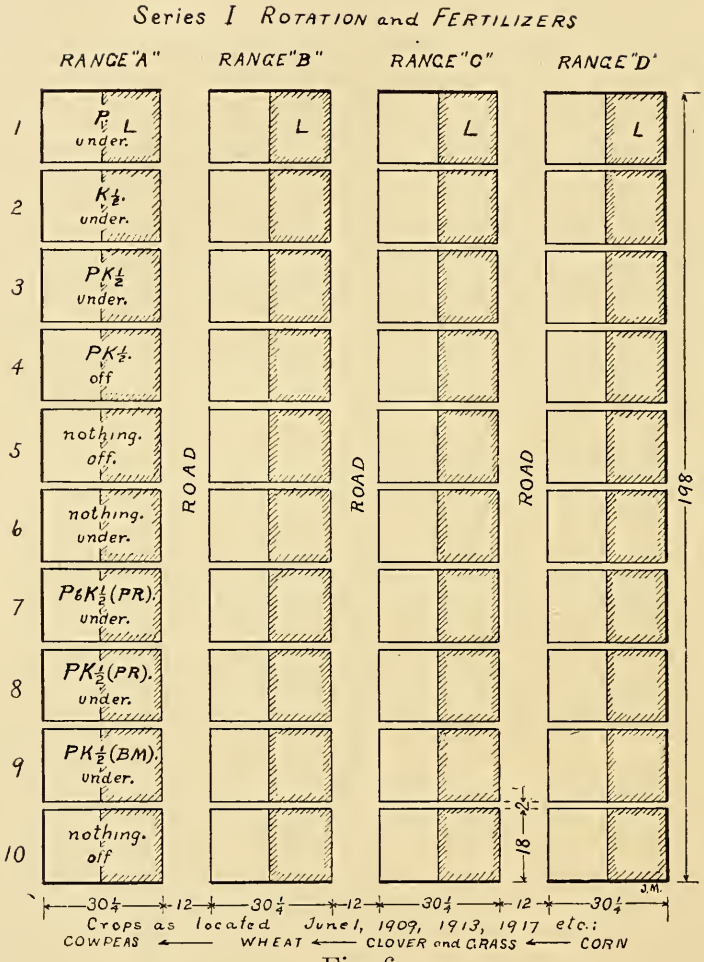


Fig. 6.

EXPLANATION: Size of plots 18 ft. x 30¼ ft. (one eightieth acre) with 2 ft. paths between.

Size of Ranges 198 ft. x 30¼ ft. with 12 ft. road between.

Fertilizers are applied once in rotation (4 yrs.)

P=300 lbs. high grade acid phosphate per acre having 16% P_2O_5 P2=twice above amount; P6 six times, etc. P (PR)=150 lbs. per acre ground rock phosphate. P (BM)=200 lbs. per acre steamed bone meal 24% P_2O_5 K=100 lbs. muriate of potash per acre 50% K_2O F=6 tons farm yard manure per acre. L=2000 lbs. lime per acre.

Right-half of each range has lime applied once in each rotation.

"Off" and "under" indicate whether cowpea crop is to be harvested or turned under as green manure.

grass is turned under the spring of the corn year. After harvesting the corn the fertilizer is applied as shown on the cowpea range—the application being made but once for the entire rotation. Follow the corn by a winter cover crop of rye to be turned under in the spring when lime is applied to the right half of the range and cow peas again sown. This application of fertilizers and lime coming between the corn crop and the cowpea crop occurs on each range but once in each four years but as the series has four ranges each showing an annual phase of the rotation the fertilizers and lime are applied on one range each year. The illustration (Fig. 6) necessarily shows the crops as having fixed positions on the ranges but it should be understood that the regular succession of crops will make the condition represented applicable but once in each four years, viz.: 1908, 1913, 1917, etc.

The corn and wheat ranges may be untilized as breeding plots.

Since the fertilizer is to be applied but once in the four years of the rotation, in beginning the demonstration where one wishes to start with all four of the crops the first season fertilizers may be applied on all the ranges as follows: full amount preceding the cowpea year, 3-4 amount preceding wheat year, 1-2 amount preceding the clover and grass, and 1-4 amount preceding corn.

This work in series one should not be attempted until the school is well established, since it entails care in its preparation and may be of little value during the first few seasons before the permanent effect of the various treatments and cropping system bgins to tell.

Any county high school or any public school in Tennessee accredited to this university which can undertake these demonstrations with some assurance of success will command the services of the university. Such services include laying out of the plots agreeable to a plan uniform for the entire State; advice by correnspondence with this department and with the Experiment Station; occasional personal inspection; a system of recording results on blank forms furnished by this department; and the dissemination of results by printed reports and by conference of teachers. Since the Department of Agricultural Education desires to be a clearing-house for results, criticisms, and alterations for all schools looking to us for this aid and advice, any changes from the plan designed to lessen the work should first come to this department. The advantage of a uniform system for the entire state, whereby teachers may be able to communicate by letter or conference, to report results on a blank provided by us for permanent record and in making possible the distribution of a brief printed annual report of all the schools for the benefit of all, will appeal to all systematic workers.

Many other plots can be used to advantage where time will permit, to demonstrate approved varieties and methods especially in gardening but they will be left to the teacher's individual plans. The foregoing three series include all of the demonstrations essential to the course of study as presented.

A New Form of College Extension Work.

Agreeable to the plan outlined in the January issue of this journal twelve county high schools, scattered throughout the State, have planned to undertake the course of five lessons which are to be given before the first of June, the first and second of which are outlined in this issue as Tennessee High School Lessons in Agriculture. In addition to these outlines, which will also be issued in leaflet form, bulletins from four states and a number from the U. S. Department of Agriculture are being used for reading assignments. The interest is very high at the ten schools visited to date, but the success of the work will of course call for a sustained interest to the end of the year. Classes have been met and the work begun in County High Schools at Madisonville, Sparta, Millington, Kerrville, Ripley, Arlington, Rosemark, Ashland City, Clarksville and Paris. Others to be met at once are in Lawrenceburg, Newport and possibly Decherd and Jacksboro. These together are as much as seem advisable for one person to undertake to visit monthly but should the work prove successful somewhat more may be offered later.

Tennessee High School Lessons in Agriculture.

Lesson I. Dent Corn; External Features of the Ear and Kernel.

NOTE. It should be remembered that the accompanying table of descriptive terms for use in criticising the ear and kernel of corn does not attempt to imply merit or demerit though quality is sometimes involved. Its chief value is in supplying the terms necessary for description of the morphological features of corn and to draw attention to differences of the several varieties. In the naming of subheads the mixture of different parts of speech is unavoidable.

FORM OF THE EAR AND ITS PARTS. (*Adapted From Ill. Bul.* 63.)

LENGTH: 9-11 inches
CIRCUMFERENCE: 7¼-7¾ inches, 3 inches from butt.
SHAPE: 1. cylindrical, 2, tapering
    length to circumference as 4:3
ROWS OF KERNELS:
    number 3 inches from butt; 16 to 26
        1. odd or 2. even number
    arrangement; 1. distinct pairs, 2, indistinct pairs
    space between rows; 1. narrow, 2, wide
    direction; 1. straight, 2, twisted to right or 3. left
    extension; carried well out on butt and tip
    continuity;
        continuous *from end to end of row*
        broken *or discontinuous*
        lost *disappearing after extending beyond 3 inches*
BUTT: even; *square across with end of cob exposed*
    shallow and broad
    deep and narrow
    compressed; *end of cob rounded*
    enlarged; *large with no extra rows or kernels*
    expanded; *large with extra rows or kernels*
    open; *greater space between rows at butt*
    depressed; *kernels at butt flat and short, indicating a tight husk*
    kernels diverging at summits
TIP: bare; 1. much or 2. little
    filled: *entire end of cob covered with kernels*
    kernels in rows
    cob; 1. round or 2. flattened

KERNEL:
1. Attachment;
   1. firm, 2. loose
   1. upright, 2. leaning toward tip
II. Dimensions (see diagram on next page)
III. Shape;
   view of flat side,
      straight wedge-shaped, *edges straight, tapering from summit*
      round wedge-shaped, *edges rounded, tapering*
      square at top, *corners not rounded at summit*
      shoe-peg form, *long and narrow*
      rectangular, *short and broad, same breadth at both ends*
      rounded corners, at base and summit
   view of edge,
      beaked, *sharp, tapering summit*
      overlapping at summit *like shingles of roof*
      slightly sharp, *projection from chit side at summit*
      space at cob, *wedge-shaped, with space between kernels of the same row*
   view of top,
      four-sided
      roof-shaped, *five-sided, each row interlocking with an adjacent row*
      irregular
IV. Indentation;
   round smooth dented (dimple dented)
   long smooth dented
   bridge dented, *long with fold across the middle*
   crease dented, *parallel edges of dent pressed toward each other*
   pinch dented, *edges of dent pinched closely together*
   rough projection dented, *various kinds not previously classified*
   crumple dented; *coat wrinkled as in sweet corn*
V. Color;
   1. pearl white, 2. cream white, 3. pure white
   4. deep yellow, 5. light yellow
   6. red, 7. variegated

COB: Size; 1¼ inches in diameter 3 inches from butt
Color; 1. white, 2. light red, 3. deep red

SHANK: half the diameter of cob, judged by scar at point of attachment

Proportion of Grain on Ear.	Ears	Grain	Cob
Legal Bushel	70 lbs.	56 lbs.	
Legal Ratio	5	4	1
Legal Percentage	100	80	20
Corn Breeders' Standard	100	88	12

The Ideal Ear of Dent Corn.

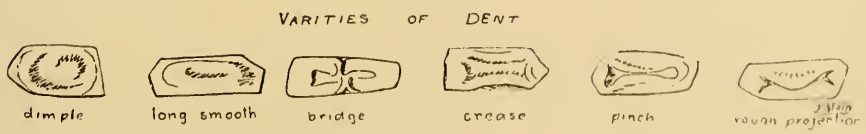
The ear which corn breeders try to produce is cylindrical, 10 inches long, 7½ inches in circumference, with 20 rows, distinct and running straight from butt to tip, with narrow space between rows, and somewhat rough surface.

The butt is deep rounded with a narrow cavity, and the tip completely filled. Both butt and tip are of such shape as to carry out the cylindrical form, and with kernels in distinct rows, thus securing uniformity in shape and size of kernels.

The kernels are straight wedge-shaped, stand upright and firm, without space at cob, and with moderately rough summits; when shelled they are 88 per cent of the total weight of the ear.

The cob is 1¼ inches in diameter, cylindrical or slightly tapering, rounded at the butt and circular at the tip, with shank scar ⅝ inch across, and should agree in color with the kernels—a white cob with white kernels and a deep red cob with yellow kernels.

The ear should have the characteristics peculiar to its variety which may sometimes be at variance with the foregoing description.



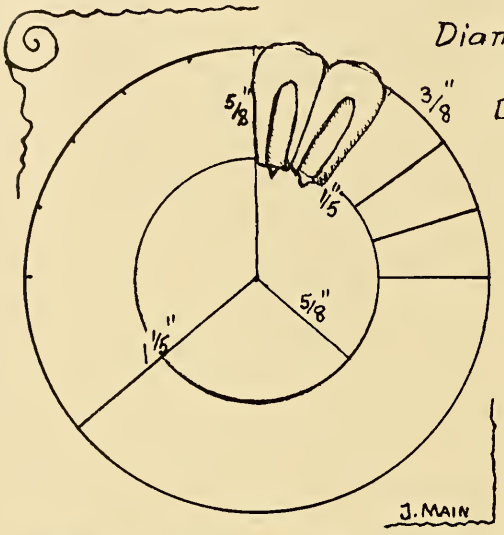
CROSS SECTION OF EAR OF DENT CORN. EXACT SIZE.

Number of rows 20. Circumference of ear $7\frac{1}{2}$ inches

Diameter of ear $7\frac{1}{2} \div 3\frac{1}{7} = 2\frac{3}{5}$ in.

Diameter of cob $1\frac{1}{4}$ in.

Circum. cob $1\frac{1}{4} \times 3\frac{1}{7} = 4$ in.



SIZE AND SHAPE OF KERNEL

Width; summit, $\frac{7.5}{20} = \frac{3}{8}$ inch

Width; tip, $\frac{4}{20} = \frac{1}{5}$ inch

Depth, $\frac{2.4 - 1.25}{2}$ + depth of pit in cob $= \frac{5}{8}$ inch

[not including tip cap and dent projection]

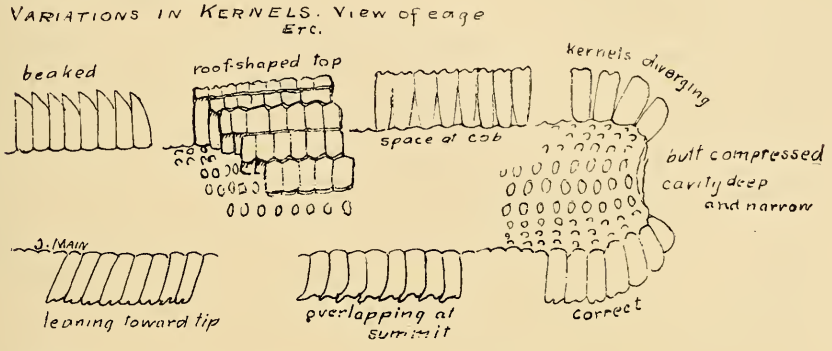
In *corn judging* such of the morphological features of the foregoing table as indicate merit are considered as will be seen in the following points of the score card.

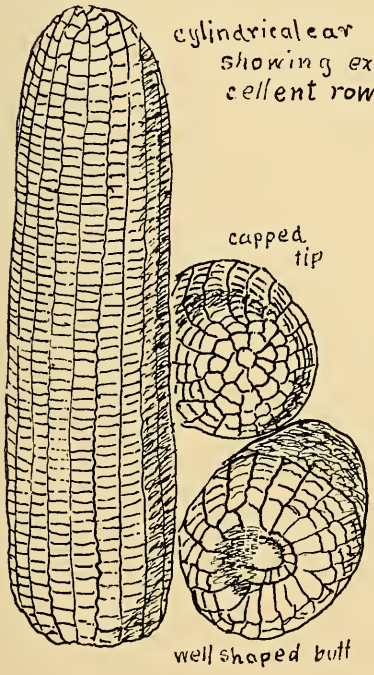
Points of the Corn Score Card.	
Trueness to Type	10
Uniformity of Exhibit	5
Shape	10
Color	10
Seed Condition	10
Tips	5
Butts	5
Kernel Uniformity	5
Kernel Shape	5
Length	10
Circumference	5
Space Between Rows	5
Space at Cob	5
Proportion	10
Total	100

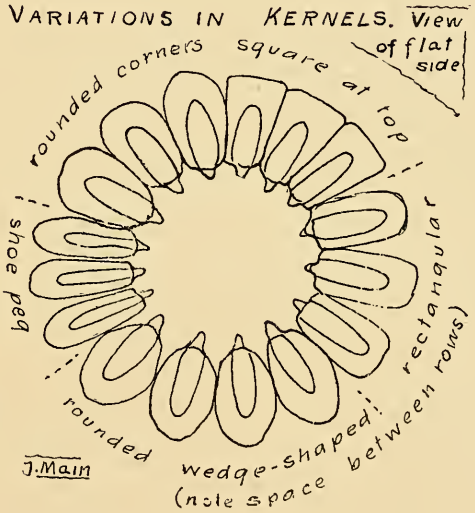
Some of these points are not referred to in the foregoing table and so call for special attention. Seed condition is purely a matter of quality, hence, important though it is, it cannot be considered in the foregoing table where morphological beauty and not virtue is the leading consideration. In Trueness to Type is involved the exhibitors ability to select corn that truthfully represents the variety which he claims it to be and it is himself and not his corn that is really scored under this head. For instance, if the variety average twenty-two rows to the ear and he selects his sample of ten ears that average 18 rows his corn is not true to type in that one point and is scored off according to the judges mental estimate of the importance of that defect. And in Uniformity of Exhibit the ten ears are scored off according as they are unlike one another. Thus in the matter of number of rows, if each has eighteen they would be perfect in uniformity in that one particular while not true to type. But if while varying all the way from 16 to 28 rows they have an average of 22, the correct average for that variety, they should be scored off for lack of uniformity though correct in type. And so for each of the many other features of the sample and of the variety.

Skill in judging can be acquired only by practice under a teacher who is familiar with varieties and knows the value to put on such defects as may occur in space at cob, color, kernel shape, and others which the less experienced may see without knowing how serious the defect may be as expressed in percentages. The expert judge should

be able to close his eyes and call up a vivid mental picture of the perfect ear and have an accurate and invariable measure for all departures from his ideal. And his ideal must be standardized occasionally by conference with other judges all of whom agree on the ideal ear and kernel.







Suggestions to Teachers. Have each pupil bring an ear and after sufficient class drill on the correct use of terms and on the quick recognition of the various features of the ear and grain each pupil should be able to hold up an ear before the class and "go through it" orally. Finally, let each pupil hand in his ear with a complete written description of it with diagrams and drawings of details to be criticized for correctness of observation and description as well as an exercise in English composition. Save the ear for use in the next lesson, labelling it for identification by means of a wooden peg pushed into the pith at the butt and bearing a character or initial of the pupil. Shell off only sufficient to show space at cob, removing for that purpose two rows near the middle for the distance of an inch. Estimate the diameter of the cob from measurements of circumference of the ear and length of the kernel. The proportion of grain should not be found until after the second lesson (Viability) is finished.

J. MAIN.

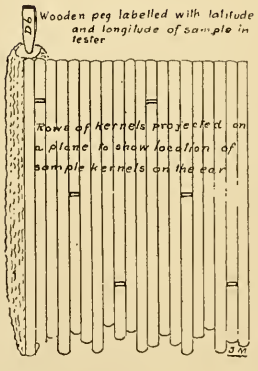
LESSON II. Testing Viability of Seed Corn.

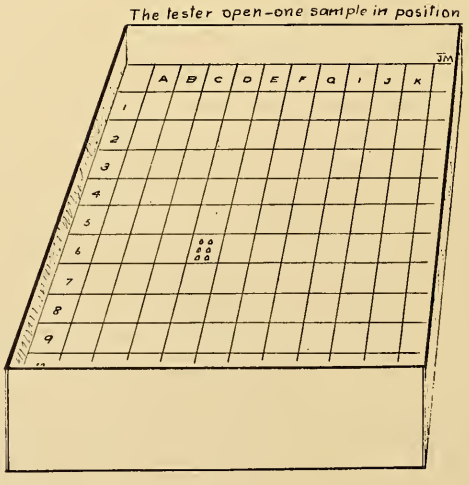
(Adapted from O. E. S. Bul. 186 and other Sources.)

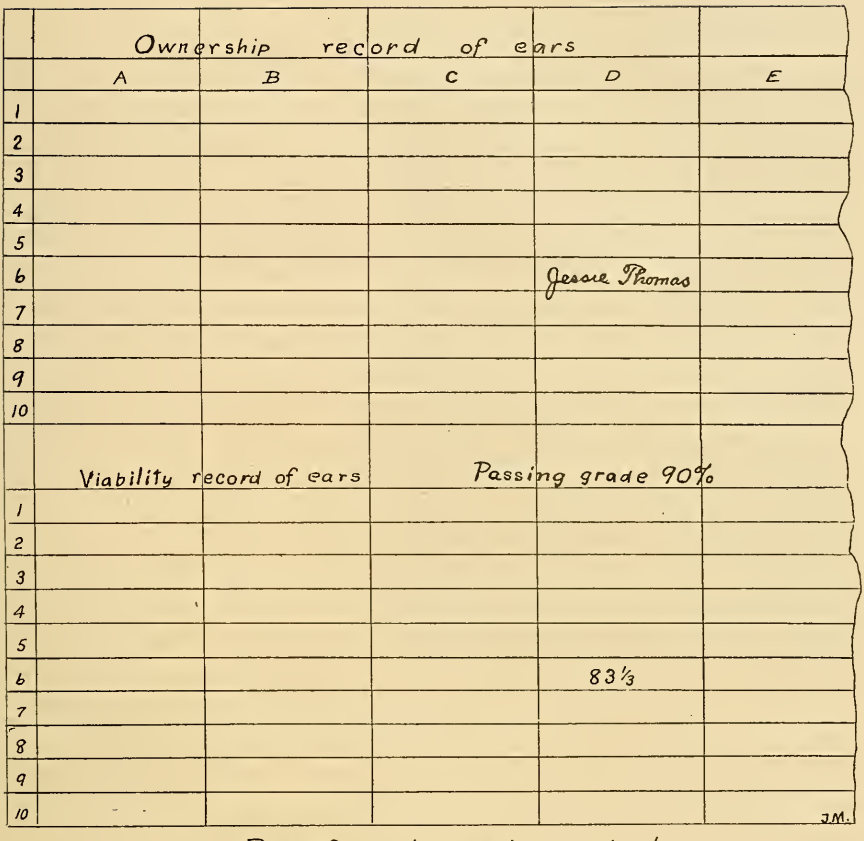
Preparation of box;
- material, light pine
- dimensions, 2ft.x3ft.x5in. open at top
- contents
  - sawdust, 2 inches dripping wet
  - cloth, muslin ruled in checks (see accompanying figure)
    - size of checks, 2 inches x 3 inches
    - marginal designation, letters for longitude, figures for latitude

Beginning the test;
- selection of ears; where, when, in field in Sept.
- selection and removal of kernels 6 from different parts of ear (see figure)
- position and arrangement in checks hearts up, like 6 spot domino
- labelling ears, wooden pegs marked with latitude and longitude (see figure)
- preserving ears, warm, dry, safe
- covering two muslin cloths, two inches wet sawdust

Completion of test;
- conditions of germination, heat, moisture air, protection
- adoption of a standard, high enough to secure a good stand
- keeping of record, (see figures)
- time, 7 to 14 days
- removing covers, first cloth with sawdust, next cloth carefully
- computing percentages, strong seedlings $16\frac{2}{3}\%$, weak $8\frac{1}{3}\%$, ungerminated 0
- identifying and sorting ears, at or above standard, seed; below, feed


Wooden peg labelled with latitude and longitude of sample in tester
Rows of kernels projected on a plane to show location of sample kernels on the ear





	Ownership record of ears				
	A	B	C	D	E
1					
2					
3					
4					
5					
6				Jessie Thomas	
7					
8					
9					
10					
	Viability record of ears		Passing grade 90%		
1					
2					
3					
4					
5					
6				83⅓	
7					
8					
9					
10					J.M.

Page from teacher's note book

Suggestions to Teachers.—The pupils should see as much of the entire process of making and filling the tester and beginning the test as the teacher can manage to show before the class. At the end of the required time, which is longer in cold weather than in warm the tester should be opened before the class and with a diagram of the checked cloth on an adjacent blackboard. Let three pupils of good judgment and fairness come and judge each sample of 6 kernels and compute the percentage for that ear, writing it in the approapriate check on the blackboard. When this is finished remove the tester and bring in the corn with labels attached and sort it into two piles for **feed** and **seed** before the classes as determined by the passing grade, the grade in the checks on the blackboard, and the peg labels in the ears. A written description, including diagrams of the entire process, may be prepared by placing on the blackboard the accompanying blackface outline (omitting information there given in Roman type). Where the same ear is used as in Lesson I this test may be written as a continuation of that exercise and the entire description with drawings submitted to us in a competitive test for publication in The U. T. Farmer. J. Main.

PERSONALS.

The Short Courses have a good attendance this year.

The "Agriculture Club" elected new officers at its last meeting. Shofner was elected president; Farrow vice-president; Worthington secretary and treasurer; Neal critic; and Parman, sergeant at arms.

The club room is being handsomely furnished, several appropriate gifts have been received from friends of the club.

The Agriculture men have out a basket ball team which is doing good work under the able management of Mr. Shofner.

The above is a cut of Mr. E. E. Miller, who has but recently been made Managing Editor of The Progressive Farmer, published in Raleigh, N. C. Mr. Miller is a former Short Course student of the University and we are certainly glad to learn of his success.

Although still a comparatively young man he has gained quite a reputation by his writings on agricultural subjects and is known over the country as a contributor to the leading farm papers of America. Having been a farmer himself in Tennessee he not only possesses the practical knowledge of farming, but has given much time to the study of the scientific side as well. As a student at the University Mr. Miller displayed much ability and we predict for him a bright future in the field of work he has chosen.

Seven hundred and fifty-five persons, including his Excellency, Hon. Chas. Deneen, Governor of Illinois, had at the end of the first week, registered for all or part of the two weeks' instruction given at the College of agriculture in connection with the Corn Growers' and Stockmens' convention in Urbana. Almost every county in the State is represented. Nearly one hundred women are registered. Ninety-three young men are in attendance on scholarships earned in corn judging contests, or other study classes conducted by the Farmers' institutes.

Dr. Ayres and Prof. Main were our representatives on the program of the Tennessee School Officers' Association which held its annual meeting in Nashville on January 12, 13 and 14, 1909.

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BEING A BOY

One of the best things in the world to be is a boy; it requires no experience though it needs some practice to be a good one. The disadvantage of the position is that it does not last long enough; it is soon over; just as you get used to being a boy, you have to be something else, with a good deal more work to do and not half so much fun. And yet every boy is anxious to be a man, and is very uneasy with the restrictions that are put upon him as a boy. * * * Say what you will about the general usefulness of boys, it is my impression that a farm without a boy would very soon come to grief. What the boy does is the life of the farm. He is the factotum, always in demand, always expected to do the thousand indispensable things that nobody else will do. Upon him fall all the odds and ends, the most difficult things. After everybody else is through he has to finish up.—Charles Dudley Warner.

THE U. T. FARMER

Vol. III. MARCH 1909 No. 6

IMPORTATIONS OF THE BROWN-TAIL MOTH PREVENTED

On January 9, of the present year a letter from the State Department of Agriculture, Albany, N. Y., came to this office stating that nests of the Brown-tail moth were being found upon imported seedlings nursery stock, chiefly that coming from Angiers, France. Knowing that many of the larger nurseries in Tennessee purchase foreign seedlings; a copy of the following letter was immediately sent out to the 245 nursery firms in the State.

Office of Tennessee State Board of Entomology.

Knoxville, Tenn., February 5, 1909.

To the Nurserymen of Tennessee:—

This season's foreign nursery stock, chiefly that coming from Angiers, France, is highly infested with the young of the Brown-tail moth. This is one of the worst insect pests known. Its introduction into Tennessee would be a calamity to the fruit and timber interests of the State.

It is necessary to act at once, and we therefore ask you to hold all importations unopened until they can be inspected. If you expect any imported stock, or have received any, let us know by return mail. An immediate inspection will be made. The foreign stock chiefly infested is seedling apple, pear, mahaleb cherry, manetti rose, quince, elm and amalanchier.

Please give this matter your prompt attention.

Very truly yours,

H. A. Morgan, Secretary.

Prompt replies from the above letter came from nearly every nurseryman in the State; nine stating that upon receipt of the their expected shipments notification would at once be sent to the office. No cases to be opened until an inspection could be made. Foreign shipments from France began arriving in Tennessee early in February.

Results from Inspection:—In all the foreign shipments webs of the Brown-tail moth, averaging one to the thousand, were found. In those shipments which had been repacked in this country there was a smaller infestation, some having none. The trees upon which the nests occurred were: pear, apple, mahaleb cherry, plum and quince. Some nests were

found loose among the packing. The trees having nests attached were immediately burned together with the packing. A considerable amount of the uninfested stock was dipped in miscible oil. A careful examination resulted in finding between 150 to 200 living caterpillars, about one forth of an inch long, in each nest.

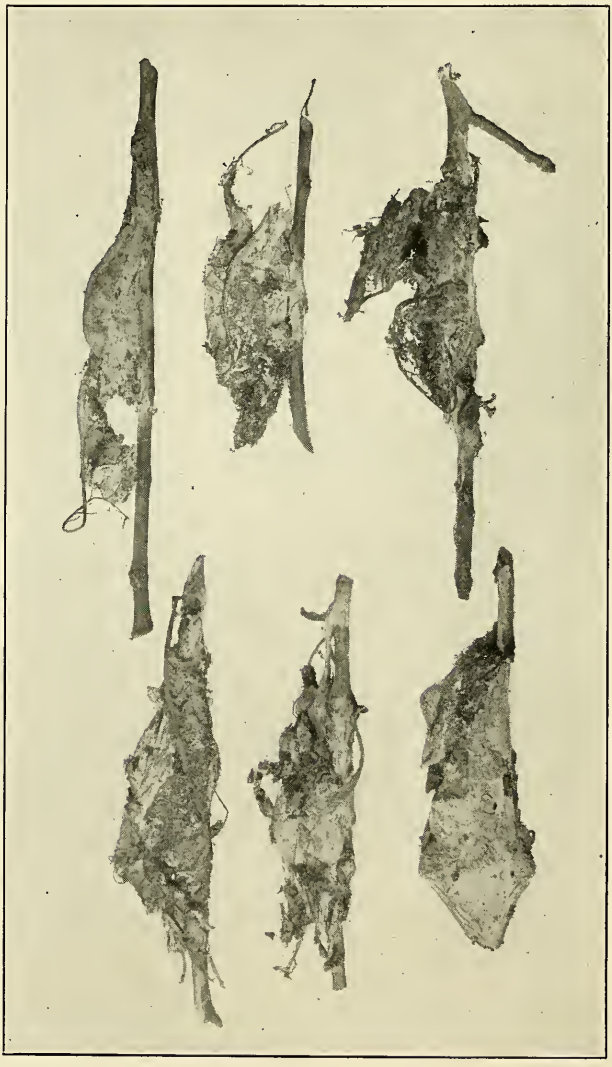


Fig. A.
Winter Nests of Brown-tail Moth.

It was fortunate that none of the shipments coming into the State contained egg nests of the Gypsy moth as this insect is frequently found associated with the Brown-tail moth. An egg mass of a related species however was found in one of the shipments.

Steps Taken to Prevent the Brown-tail Moth:—The State Board of

Entomology has determined to limit the importation of nursery stock into the State from regions where the Brown-tail and Gypsy moths prevail. Notifications in advance will have to be sent and shipments from such areas will have to be inspected. Notification of prospective importers will have to be sent the board in advance in order that a every precaution may be taken prior to and after arrival of stock.

Since some inquiry has come to the office for information regarding the life of the Brown-tail moth a general outline of the history and life of this insect is given.

Fig. B.
Adult Moth, Natural Size.

Life History of the Brown-tail Moth:—The Brown-tail moth is a native of Europe. It is supposed to have been introduced into Massachusetts on ornamental shrubs about 1885 but not until 1890 did its injuries and annoyance attract considerable attention. Efforts was made to eliminate this pest in Massachusetts but the public not appreciating the gravity of the situation insufficient funds were appropriated for the task of eradication. By means of the wind, vehicles and other ways a number of eastern states have been invaded by the Brown-tail moth.

The office in Massachusetts for suppressing the Gypsy and Brown-tail moths, the Bureau of Entomology of the United States Department of Agriculture as well as Experiment Stations of states where this pest occurs are actively at work seeking its control through the importation and breeding of parasites and other means.

The Brown-tail moth is a medium size white moth, readily recognized by the reddish brown tuft at the end of its abdomen. These moths appear in July and deposit oval egg masses on the underside of leaves. These

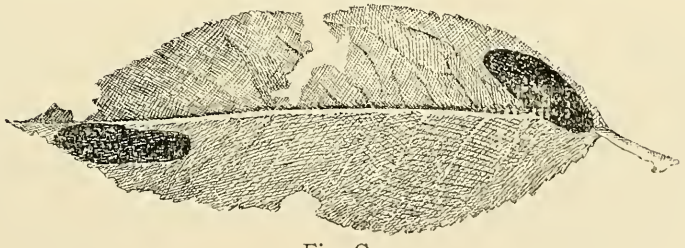


Fig. C.
Egg Masses.

egg masses are shown in Figure C. Hairy caterpillars hatch from these eggs in August and begin at once to feed upon the vegetation. They soon begin to web together a few leaves which later form the winter nests. Figures B and C show respectively the caterpillar and the winter nests.

The cold weather is spent in these nests. In April the caterpillars come forth and feed upon the developing buds and leaves. The full grown caterpillar is about $1\frac{3}{4}$ inches long, readily recognized by its hairy covering, the white patches on either side and two red spots on the back near the tail end of the body. After the caterpillars have attained their growth they pass a short time in silky cocoons from which they develop into moths about the middle of July.

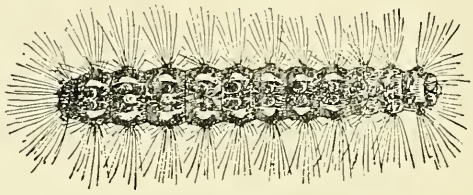


Fig. D.
Full Grown Caterpillar.

Injury Done by the Brown-tail Moth:—Too great emphasis cannot be laid upon this most injurious of all insect pests. Attacking fruit, shade, forest and ornamental trees, they completely strip them of their leaves. Evergreens thus defoliated usually die and many of the trees that shed their leaves in fall are greatly injured by this untimely stripping. Serious and painful irritation is caused to human beings by the barbed spines shed by the caterpillars and carried by the wind coming in contact with the skin. The introduction of this pest into Tennessee would mean nothing short of a calamity to the agricultural, horticultural, forest and real estate interests of the State, and it is fortunate indeed that the Board of Entomology was able to prevent its importation and subsequent distribution.

G. M. Bentley.

DECLARATION OF GOVERNORS FOR CONSERVATION OF NATURAL RESOURCES.

Issued as Farmers Bulletin 340.

The Declaration of Governors contained in this article was adopted by the conference of governors of the States and Territories called by the President to consider the conservation of our natural resources, and which met at the White House May 13, 14, and 15, 1908. Besides the governors there were invited to the conference the members of the Cabinet, the justices of the Supreme Court, the members of both Houses of Congress, representatives of the great national organizations, the Inland Waterways Commission, and, as special guests, Hon. Wm. Jennings Bryan, Mr. James J. Hill, Mr. Andrew Carnegie, and Mr. John Mitchell. The late ex-President Grover Cleveland was also invited as a special guest, but illness prevented him from attending. At the request of the President each governor brought with him to the confer-

ence three citizens from his State or Territory to act as assistants or advisers.

The object of the conference was stated by the President in his letter of invitation to the governors, in which he said:

> It seems to me time for the country to take account of its natural resources, and to inquire how long they are likely to last. We are prosperous now; we should not forget that it will be just as important to our descendants to be prosperous in their time.

Papers which discussed the present state of our various natural resources were read by experts and specialists in each respective line, and these were followed by an open discussion among the governors of the points brought out.

The conference then appointed a committee to draft a declaration, consisting of the following: Governor Newton C. Blanchard, of Louisiana; Governor John Franklin Fort, of New Jersey; Governor J. O. Davidson, of Wisconsin; Governor John C. Cutler, of Utah; and Governor Martin F. Ansel, of South Carolina.

This committee prepared and submitted the declaration which follows, and it was unanimously adopted by the conference of governors as embodying their conclusions on the question of conservation.

Declaration.

We, the governors of the States and Territories of the United States of America, in conference assembled, do hereby declare the conviction that the great prosperity of our country rests upon the abundant resources of the land chosen by our forefathers for their homes, and where they laid the foundation of this great nation.

We look upon these resources as a heritage to be made use of in establishing and promoting the comfort, prosperity, and happiness of the American people, but not to be wasted, deteriorated, or needlessly destroyed.

We agree that our country's future is involved in this; that the great natural resources supply the material basis upon which our civilization must continue to depend, and upon which the perpetuity of the nation itself rests.

We agree, in the light of the facts brought to our knowledge and from information received from sources which we can not doubt, that this material basis is threatened with exhaustion. Even as each succeeding generation from the birth of the nation has performed its part in promoting the progress and development of the Republic, so do we in this generation recognize it as a high duty to perform our part; and this duty in a large degree lies in the adoption of measures for the conservation of the natural wealth of the country.

We declare our firm conviction that this conservation of our natural resources is a subject of transcendent importance, which should engage unremittingly the attention of the Nation, the States and the people in earnest cooperation. These natural resources include the land on which

we live and which yields our food; the living waters which fertilize the soil, supply power, and form great avenues of commerce; the forests which yield the materials for our homes, prevent erosion of the soil, and conserve the navigation and other uses of the streams; and the minerals which form the basis of our industrial life, and supply us with heat, light, and power.

We agree that the land should be so used that erosion and soil wash shall cease; and that there should be reclamation of arid and semiarid regions by means of irrigation, and of swamp and overflowed regions by means of drainage; that the waters should be so conserved and used as to promote navigation, to enable the arid regions to be reclaimed by irrigation, and to develop power in the interests of the people; that the forests which regulate our rivers, support our industries, and promote the fertility and productiveness of the soil should be preserved and perpetuated; that the minerals found so abundantly beneath the surface should be so used as to prolong their utility; that the beauty, healthfulness, and habitability of our country should be preserved and increased; that sources of natural wealth exist for the benefit of the people, and that monopoly thereof should not be tolerated.

We commend the wise forethought of the President in sounding the note of warning as to the waste and exhaustion of the natural resources of the country ,and signify our high appreciation of his action in calling this conference to consider the same and to seek remedies therefor through cooperation of the Nation and the States.

We agree that this cooperation should find expression in suitable action by the Congress within the limits of and coextensive with the national jurisdiction of the subject, and, complementary thereto, by the legislatures of the several States within the limits of and coextensive with their jurisdiction.

We declare the conviction that in the use of the national resources our independent States are interdependent and bound together by ties of mutual benefits, responsibilities, and duties.

We agree in the wisdom of future conferences between the President, Members of Congress, and the governors of States on the conservation of our natural resources with a view of continued cooperation and action on the lines suggested; and to this end we advise that from time to time, as in his judgment may seem wise, the President call the governors of States and Members of Congress and others into conference.

We agree that further action is advisable to ascertain the present condition of our natural resources and to promote the conservation of the same; and to that end we recommend the appointment by each State of a commission on the conservation of natural resources, to cooperate with each other and with any similar commission of the Federal Government.

We urge the continuation and extension of forest policies adapted to secure the husbanding and renewal of our diminishing timber supply, the prevention of soil erosion, the protection of headwaters, and the main-

tenance of the purity and navigability of our streams. We recognize that the private ownership of forest lands entails responsibilities in the interests of all the people, and we favor the enactment of laws looking to the protection and replacement of privately owned forests.

We recognize in our waters a most valuable asset of the people of the United States, and we recommend the enactment of laws looking to the conservation of water resources for irrigation, water supply, power, and navigation, to the end that navigable and source streams may be brought under complete control and fully utilized for every purpose. We especially urge on the Federal Congress the immediate adoption of a wise, active and thorough waterway policy, providing for the prompt improvement of our streams and the conservation of their watersheds required for the uses of commerce and the protection of the interests of our people.

We recommend the enactment of laws looking to the prevention of waste in the mining and extraction of coal, oil, gas, and other minerals with a view to their wise conservation for the use of the people, and to the protection of human life in the mines.

Let us conserve the foundations of our prosperity.

MAKE FARM LIFE MORE IDEAL.

The farmer needs many things he hasn't got but could have if he had a better knowledge of agriculture.

The time has come when the farmer to make a success must be educated along agricultural lines. The average farmer is too set in his haphazard ways of farming to be taught.

There is just one way to teach him and that is to put agriculture in the public schools and teach the boys our future farmers.

The farmer of today is ignorant, he won't take advantage of the opportunities the Universities are offering, he says they teach theoretical farming or book-farming and not practical farming.

He is in the same old rut his forefathers were in and thinks it good enough for a farmer; he is not much anyway; he hasn't any system about his work at all, does it with his hands instead of his head and hands. Put agriculture in the public schools and educate him along scientific and practical lines of agriculture and he will not stop at the public school as he does now; but will take a course in the Universities and go back to the farm a broader man in mind anyway; he will do his work with his hands and brains.

Farm life ought to be on a higher standard; it deserves as high or a higher place than any calling or profession. Farm life to be more pleasant must have better roads, better schools, better stock, more convenient and sanitary buildings; educate the farmer and we will have all the things that go to make farm life ideal.

Some will say that agriculture cannot be put in the public school

course because the course is too long now and we haven't teachers qualified to teach it.

Put agriculture in the public school course and the teachers will have to prepare themselves to teach it; and we can afford to cut something out. for agriculture, because agriculture is the mainstay of the world it has to go on.

Agriculture in the public schools will solve the problem of making country life more ideal.—Louis Harris, Inman, Marion County, Tenn.

AGRICULTURAL EDUCATION.

The Industrial Educational Movement and the Elementary School.

The whole country at the present time is interested as never before in industrial education. There are three contributory causes, and the first may be called the pedagogical cause. For years the leading teachers of the country have been calling for a more complete curriculum for the public schools. They have seen, in every public school, three classes of students: students interested in nature at first hand; another group of students interested in man and his works; and a third group interested naturally in books. Now the school of the past provided for the third group only. The boy interested in books, interested in literary pursuits, found plenty to do; found a congenial atmosphere in the public school; but the boy interested in nature at first hand found that he could manifest his interest only on the sly, and under the ban of the school authorities. He brought nature material into the school in abundance, but he was punished for it. The boy and girl interested in man and his arts found almost nothing congenial in the old school. They were usually late if a team had broken down, if a bridge was being repaired, if a new engine was being put into the mill; if there were men discussing politics at the store they were likely to be late at the school, being interested in man and not his books. The educational people have long been working for a more complete course of study which should appeal to the boys and girls interested in these the great departments of human activity outside the realm of books. Those who were interested in books in the old days were the successes of the school; they went on to college; they became the ministers and the lawyers and the doctors of this generation; those who were not interested in books were the failures of the old school—left school at 12 or 14 to go to work to do something for themselves; and they have been the selfmade men of this generation—the men who have been carrying on the great activities in agriculture, commerce and manufactures. Now while here and there a little has been done to bring about the changes needed, this demand on the part of the educational people has not been taken very seriously throughout the country.

The second cause may be said to be the industrial cause, and there,

when you consider the reason, you come upon a rather interesting fact. The time was when practically everybody believed in the divine right of kings; they believed that the few were to rule and the others to serve. They believed that the good things of life belonged to the kings, belonged to the rulers; and it was the royal family who had the palaces, who had the fine furniture, who had the pictures and the sculpture, who had the fine tapestries, who had the hand illuminated books, and all the finest products of the arts. The change from despotism to democracy—to the belief that the good things of life belong by divine right to every man and woman—has brought about a tremendous change in the demand for the finest things. Whereas once a few demanded them, now the many demand them. Now along with that change has gone another; in the old days the craft descended from father to son, generation after generation. In Egpyt, for instance, a little fellow born into a potter's family, just as soon as he could walk began to help his father by bringing wood for the kiln; later on wheeled the clay to the bench for his father to work. As he grew older, he was initiated every day into some phase of his father's craft. His apprenticeship lasted from the time he began to take an interest in anything until he succeeded to his father's position as the chief potter in the village. The caste system was so rigid that no boy thought of questioning what his trade should be; he knew he would follow the trade of his fathers. Now you will see that an apprenticeship system of that sort, persisted in generation after generation, would develop a marvelous skill in that particular craft. The same rule held in the other crafts, of carpenters, of furniture makers, of weavers, of iron workers. The standard of technical perfection in all crafts in the course of time became very high indeed—as high as it is possible for the purely technical work of a trade to be developed. But all this has been changed. The change has been so gradual a process that we can hardly say when the transition periods occurred. First, instead of the patriarch and his trade, there came to be master and his pupils. The best potters from Etruria and Ionia and other parts came to some most famous potter. After they had learned the beginnings of their craft in their own particular clan, they sought a master elsewhere. Then later the guilds were developed, and apprentices were taken with less preparatory training and at last the apprentice came late to learn his trade and left early but half trained. Even that system disappeared and all that was left was the life on the farm, where the boy did still get a certain training in the use of his hands and a certain training in design of the most practical sort, adapting means to ends. Now even that has gone, and we have left a condition where any man may choose any trade he pleases, work at it long or short, with the help of a machine, and have as his ambition simply to receive an arbitrary wage prescribed by a labor union, whether he can do his work well or not. You will see, therefore, that there has been a constantly diminishing executive power, a constantly diminishing skill of hand. Now just put those two movements, side by side; one is

complementary to the other. On one hand there is a constantly increasing demand for the finest things the workman can produce; on the other hand a constantly diminishing power on the part of workmen to produce those things; and the time has come when there is scarcely a mechanic who can do a perfect piece of work,—not a furniture manufacturer who can build a chair that won't squeak in a month, or a plumber that can do a job of plumbing that won't smell. Meanwhile our universities give the degree of Ph. D. to a young fellow who will spend a year in proving that the change of a comma in a line of King Lear will determine the time he went insane. We build a capitol at Albany costing millions of dollars and put into it a decoration by one of the greatest artists the world ever saw and that precious picture spoiled inside of three years because we can not make a proper roof over it. O, if these universities would wake up and give a degree for something that is worth while! Well, they will. The industrial demand—the industrial demand for education—is beginning to be heard; for the voice of these manufacturers is to the accompaniment of jingling dollars, and it commands an audience that the voice of the idealist piping in his public school never reached.

There is a third cause for this industrial movement—the sociological. There are people all over the country studying the social conditions in the great cities. They find there a poverty, a squalor, a crime such as the world has never seen, in the midst of a wealth, an intelligence and a good-will such as the world has never seen, and they begin to ask, why? And they begin to suggest that one reason is that the boys and girls find nothing for themselves in the public school. The two-thirds of the boys and girls not interested primarily in the intellectual things drop out, from 12 to 13 and 14 years of age; and under the closely organized competitive industrial system which is saddled upon us, being ill-equipped, unable to keep the pace, unable to find their place, they drop out. They drop down as well as out; they make the dregs; they make the slum of the city. These sociological people tell us we must do something to raise the industrial efficiency of the average man and woman so that they will come to the level where they can co-operate profitably with their fellows; fortunately their voice is beginning to be heard; and one reason is because their voice is accompanied by the low murmur of discontent from these unsatisfied thousands, and the world has heard that murmur grow to the roar of revolution too often to hear it with complacency.

In many places a relation is already established between this movement and the work in the public schools. Everywhere teachers are asking, what can the public schools do to meet this new demand? Some are asserting that independent trade schools must be established, that the boys must be taken from the public schools and put into such schools. Others are claiming that the public schools themselves must become more industrial; the elements of the different trades must be brought down to the lower grades. Manual training high schools do not solve the

problem. The majority of boys leave school at the end of the seventh or eighth year, and therefore the work in the grammar grades must have an industrial character. But it seems to me, as I review what I have known about the public schools during the last twenty years (for I have worked in them constantly) that the solution lies not in new topics in the public schools, but in modifying the present public school courses, enriching them, so that in them shall be laid the foundations of industrial efficiency.—Henry Turner Bailey, North Scituate, Mass.

TENNESSEE HIGH SCHOOL LESSONS IN AGRICULTURE.

LESSON III. PLANT FOOD.

Chemical Elements. All substances that we can perceive, whether solid, liquid, or gaseous, are found to be made of a limited number of simple substances or elements. Thus wood, clothing, water, air, soil, metals, plants, our food and our bodies —all the limitless variety of things which we meet in nature are composed of these chemical elements of which about eighty are known to chemists. These elements unite with one another to form an infinite variety of compounds though they may exist free from combination as in the case of metals. Any text book on chemistry will give the names and symbols (or abbreviations) for all of these elements.

Food. We take food ordinarily for two purposes: first, to supply our bodies with the proper chemical elements and their compounds which are of the right composition to build up our body tissues; and, secondly, to supply our bodies with the energy which usually goes with food.

Plant Food. What has been said about food for man applies only partially about food for plants for the energy needed in plant growth comes from the sun, and not from the plant food. Therefore, the chief purpose of plant food is the supplying of the materials for plant growth which must contain the right chemical elements. For certain chemical elements are necessary for plant growth and for these the plant will accept no substitute. These materials furnishing plant food are called fertilizers. Chemical analysis of plants and plant products shows the presence of a limited number of chemical elements in various compounds. Of the 75 or more chemical elements thirteen are always present in plants and of these, ten are found by experiment to be necessary to plant growth, the other three being unnecessary but always present in plants growing in a state of nature.

Plant Food in the Seed. The chief concern of the parent, whether plant or animal, is to provide nourishment for the offspring. Since the seed is the offspring of the plant and since the plant must lose all connection with its offspring when the seed ripens and is cast into the soil, the only provision for food the plant can make for its offspring—the seedling—must be in the seed itself. And so we find in the seed all the food elements necessary to supplement the moisture which nature supplies the young seedling, water supplying two of the ten elements and the plant food stored in the seed by the mother supplying the others.

Plant Food Supplied by Air and Soil. After the seedling in its growth has used all the food stored up in the seed by its mother plant it must be able to get its food from the air and water and soil or it will perish. So the chief concern of the seedling is to produce a green leaf spread out in the air and sunlight and a root penetrating the moist soil from which to draw its food when the store in the seed is exhausted. Of the ten necessary elements of plant food, three are taken from the air and the water of the soil, leaving seven to be supplied wholly by the soil.

Poor Soils. A soil that does not supply all of the seven elements of plant food

---

by Josiah Main

(or fertility) in form and amount sufficient for thrifty plant growth is called a poor or infertile soil. We recognize a poor or rich soil by the thrift of the plants growing in it. Lack of thrift usually indicates lack of food. Some of the food elements, while absolutely necessary, are required in such small amounts by the growing plant and are so abundant in nature that no natural soil is ever poor for lack of them. Some soils are naturally rich in all of them but many soils are naturally poor in some of them.

Fertilizers. Of the seven elements of plant food which must be supplied by the soil, three are frequently found deficient, and when that is the case the one growing plants in such poor soil may supply them by bringing them from elsewhere in a form suited for plant food and putting them into the soil. These materials, known as fertilizers are intended therefore to supply one or more of these three elements of plant food. Others beside these three are sometimes found beneficial when applied to the soil, by making the soil more agreeable as the home of the plant but only these three are of value as plant food. Where a natural soil is deficient in only one or two of them, as frequently happens, there is no need to supply the others.

Making a Soil Poorer. All soils are made poorer by the removal of products of the soil without a compensating return of the plant foods removed. Harvesting and marketing grain crops is a very rapid means of making a soil poorer.

Classification of Chemical Elements Found in Seeds.

Always present but not necessary for plant food; Cl (chlorine), Na (sodium), Si (silicon).

Supplied by carbon dioxid (CO_2) of the air; C (carbon), O (oxygen).

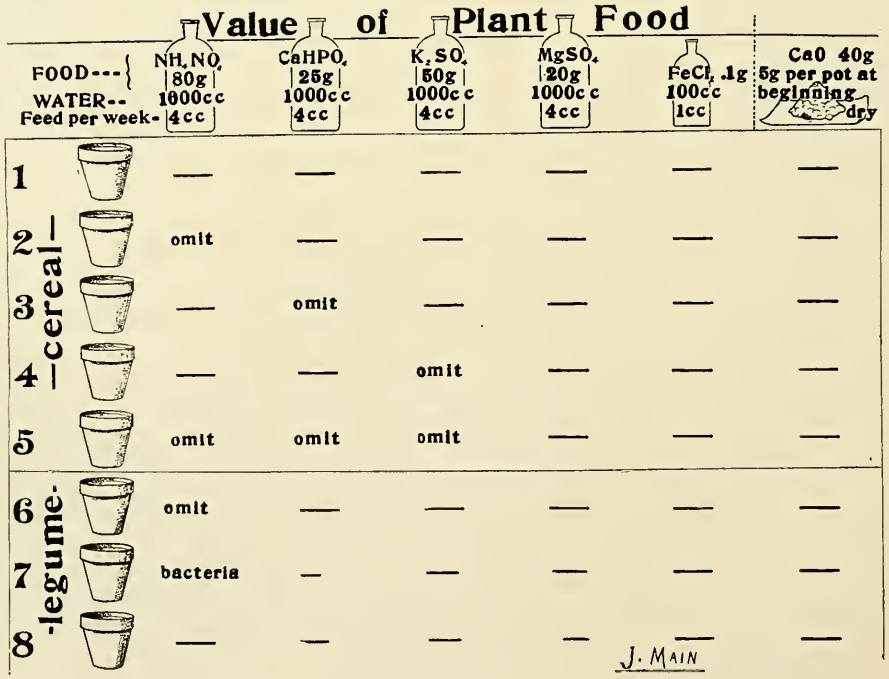
Supplied by water (H_2O); H (hydrogen), O (oxygen).

Supplied by the soil:

(1) Never deficient in soils; Fe (iron), S (sulphur), Ca (calcium), Mg (magnesium).

(2) Frequently deficient in soils; N (nitrogen), P (phosphorus), K (potassium).

Substances applied to a soil to supply the deficiency of N. P. or K. are known as Fertilizers.



TESTING THE PLANT'S NEEDS FOR FOOD.

The Plants.

Wash eight gallons of sand until there is no soil left in it. Dry and mix with it eight tablespoonfuls of air slaked lime. Procure eight new one gallon flower pots with saucers; place a cloth in the bottom of five and fill with the prepared sand. Plant ten wheat seeds or four kernels of corn in each pot. Put them in a warm place in the sunlight and water them daily with rainwater or cistern water.

Take the three remaining gallons of the prepared sand and thoroughly bake or roast it for half an hour to kill all possible germs there may be in it. Wash three of the gallon flower pots and fill them with the baked sand as before and plant in each five soja beans and care for them as in the case of the wheat seedling.

The accompanying figure shows the eight pots on the left, five containing cereals (wheat or corn), and three containing legumes (soja beans). Excepting the Ca contained in the lime, these seedlings can get none of the seven elements of food supplied by the soil except what is put in from time to time, though they may soon be able to get the three necessary elements supplied by the air and water.

The Food.

At the top of the accompaning figure are the seven necessary plant foods which the soil supplies growing plants. It will be noticed that these foods are compounds, each being made of a combination of several chemical elements. But the important thing about them is that each contains one of the seven elements which the plant must have for its food; namely, N, P, K, Mg, Fe, Ca and S, and some containing two, as in the case of the third and fourth where S is in combination with another necessary food element. These compounds which for our purpose may be obtained chemically pure are familiar foods which in impure forms the plant ordinarily feeds upon the soil. (Quart Mason jars may be used where bottles are not available).

Feeding.

On the accompanying figure the pots of seedlings and the plant foods are so placed as to indicate the method of feeding. The dashes in the column under each food indicate that it is to be supplied to each pot opposite which a dash is made. Or, passing to the right from each pot we supply it with the food above each dash on that horizontal line. As the last food Ca element was supplied in the lime (CaO), mixed in the sand of each pot, we do not have to trouble ourselves further about that element. The others are given weekly in the amounts indicated, omitting from each pot such foods as have the word "omit" or "bacteria" in the column beneath them and opposite the pot being supplied.

Since no natural soil is deficient in Ca, Mg, Fe, or S as food for the plant, it is not the purpose to find out the lack of such food on the plant, hence they are supplied in sufficient amount to all the plants.

In the preparation of these plant foods chemically pure foods soluble in water are used in such amounts and proportions as has been found best for the good of the plant. Here as in the weekly feed the metric system of weights and measures is used.

Care must be taken to avoid mixing plant foods in the different bottles. The measure used in giving the weekly feed should be rinsed in passing from one food to another. In case a mistake is made by putting the wrong food in a pot the best thing to do is to leach out as much of the food as possible by pouring water on the top of the sand and letting it run out below.

Inoculating.

Opposite the seventh pot and under the first food (N) is the term "bacteria" by which is intended the inoculation of that pot with that form of bacteria that form the tubercles on the roots of the soja bean and enable it to get its nitrogen from the air, thus becoming independent of the soil supply of that element. Inoculation,

which should be done before the soja bean seedling has used all the N stored for it in the seed, may be accomplished in several ways and frequently occurs accidentally. The purpose in baking the sand was to prevent inoculation except where desired.

Following are some of the methods of inoculating:

(1) If the beans be sprouted in a soil in which soja beans grew and produced root tubercles last year we may remove them before they have profited from the food stored in that soil, rinse the roots clear of soil and transplant into our pot seven with the assurance that they will have been inoculated. (2) Frequently the rinsings from a soil which grew soja beans last year will contain enough bacteria, after standing until it settles, to inoculate the seedling in the pot of sand where germinated. (3) And lastly the scientist uses a pure culture of such bacteria in a liquid form which may be poured into the pot and insures inoculation.

RESULTS OF THE EXPERIMENT.

After about six weeks of normal growth a difference should be seen in the thrift, color and form of growth in the plants of the first five pots and in the plants of the 6th, 7th and 8th. This difference if we have been careful to equalize all other conditions we may attribute to the difference in the method of feeding. By comparing Nos. 2, 3, 4, and 5 with No. 1, the effect on the plant of a lack of N, P, and K, separately and collectively will be apparent. By comparing Nos. 6 and 7 we can see the effect of inoculation on a legume that has no other means for securing N and may be able to tell whether it is a sufficient substitute for the N supplied in the food of No. 8. Before disposing of the plants the roots of the soja beans should be examined for root tubercles which being produced by the microscopic soja bean bacteria and occupied by them as a home, indicate whether inoculation has been successful.

JOSIAH MAIN.

LESSON II. (Addenda).

GOOD VARIETIES OF CORN TO PLANT IN TENNESSEE.

Those interested in growing well bred varieties of corn will appreciate the following information which we get from Prof. Chas. A. Mooers of this station.

Varieties for Tennessee may be put into two groups of which one group would include those varieties suited to conditions such as are found on poor upland soils throughout the state and the other group including varieties suited to richer lands, The latter group is naturally the larger and includes some of the varieties found in the former.

Of the upland varieties Hickory King stands first and as early maturing varieties. Silvermine, a white dent, and Leaming, a yellow dent, are both good. Such varieties on poorer upland soils should be planted about 6,000 stalks per acre.

For richer lowlands Webb's Watson and Huffman are the best bred native varieties, both being white with white cobs. Reid's Yellow Dent has proven a good variety in the rich basin region and has the advantage of maturing early. Some red cob varieties of white corn are good, but they are not well enough standardized to be readily identified. Also the three upland varieties before mentioned have made good yields on richer lands where planted about 10,000 stalks per acre. The other lowland varieties should be planted about 8,000 stalks per acre including Albemarle Prolific, the best Tennessee variety for silage.

Seed of some of the native varieties may be secured by addressing the following: "Webb's Watson," M. C. Webb, Shelbyville, Route 5. "Hickory King," W. N. Rudd, McMinnville and W. J. Gilbreath, Lawrenceburg. "Huffman," T. L. Huffman, Normandy. The northern varieties are advertised in northern farm journals.

LESSON IV.—HOW PLANTS TAKE MINERAL FOOD.

ACIDS AND ALKALIS. All are more or less familiar with acids and alkalis through every day experiences with such acids as vinegar and such alkalis as lye, ammonia, and lime. We know from contact with carbolic acid or sulphuric acid and with lime and lye that they would burn and destroy the tender parts of any seedling that might come into contact with them. In such form no element could be used by the plant as food.

Each of the seventy-five or more chemical elements has certain fixed and well known properties including either the property of *acidity* or that of *alkalinity*. How

then can the tender seedling use as food the ten necessary elements of plant food some of which have acid properties and the others alkaline.

SALTS. By mixing water that is too hot with water that is too cold we can make the temperature just right to wash our hands and face. So an acid and an alkali combine to form a substance that has none of the harmful properties of the acid and alkali composing it, such properties mutually neturalizing each other. Such a substance made by the union of an *acid* with an *alkali* is called a *salt,* of which common table salt is an example. A salt therefore must always contain at least two elements and usually contains more in a very intimate combination. A salt is indicated by a combination of the *symbols* (letters) which stand for the elements composing it. *The plant takes its food in the form of salts that will dissolve in water.* The figure used in Lesson III shows bottles containing dissolved salts of plant food.

OSMOSE. A spoonfull of table salt will completely dissolve and disappear in a cup of water and the dissolved salt will be found to have spread equally to all portions of the water. If the cup be made with a partition across it completely separating the water into two portions and the salt be put into the water on one side only, the partition may prevent any interchange and the water on one side remain salt and the other fresh indefinitely.

But it is possible to have a partition which, while having no hole or opening in it, will nevertheless permit the passage of liquids and dissolved salts. Many plant and animal tissues are of this kind. The passage of dissolved salts through such a partition is called *osmose* or *osmosis.*

DIRECTION OF OSMOSE. The tendency of a dissolved salt to become distributed to all parts of the liquid seems due to the activity of both the salt and the liquid in which it is dissolved. But where there is a partition that permits osmosis it will be found that the dissolved salt has more trouble to get through than the pure water has so that although some of the salt gets through the movement is more rapid in the other direction or from the side having little or no salt to the side having the denser salt solution. And such interchange through an osmotic membrane will continue until the salt and water are in equal proportions on both sides of the osmotic membrane. This osmotic force is sufficient to cause a rise against the force of gravity of the denser solution as shown by the following experiment.

TO ILLUSTRATE OSMOSIS. The accompanying figure is meant to illustrate a simple method of showing the action of osmosis. The osmotic membrane in this case is from the heart sack of a beef. The rise of water in the stem of the thistle tube shows that osmosis exerts force enough to overcome the force of gravity. At the same time some of the dissolved salt is passing out into the beaker. When the percentage of salts (or density of the solution) is the same in the liquid inside the tube as outside osmosis stops because the *osmotic pressure* is the same on both sides of the membrane.

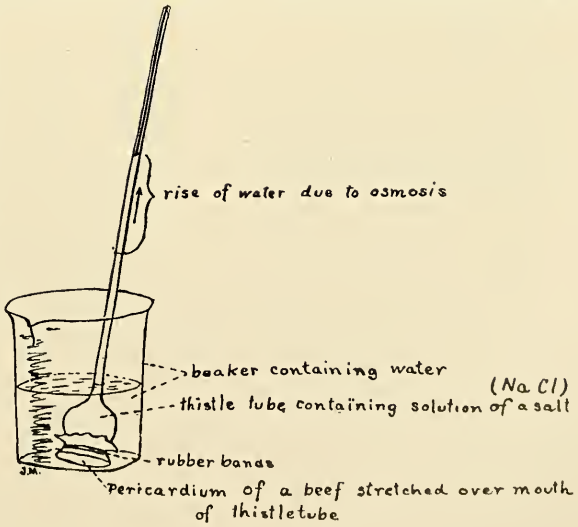

rise of water due to osmosis
beaker containing water
(Na Cl)
thistle tube containing solution of a salt
rubber bands
Pericardium of a beef stretched over mouth of thistletube

Fig. 13.

PLANT CELLS. All *living organisms,* both plants and animals, are made up of units of structure known as *cells.* The cell in the case of plants has a *cell wall* which in a living cell is lined with a thick liquid substance known as *protoplasm.* Inside the cell is also usually found dissolved salts of plant food in greater or less amount, sometimes in the form of distinct areas known as *vacuoles.* During the growth of the cell its cell wall is an osmotic membrane made of *cellulose,* a substance similar in composition to starch.

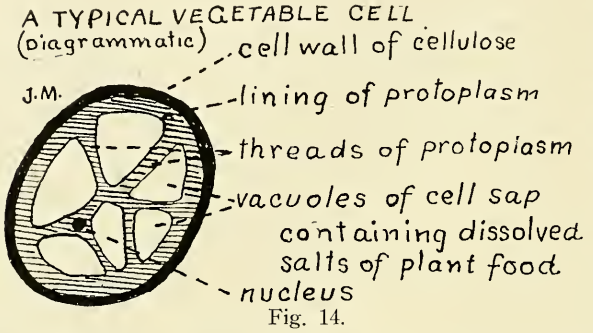


Fig. 14.

HOW THE CELL FEEDS. Each plant cell takes its food through the cell wall by osmosis. This inward passage of food is influenced partly by the protoplasm but the force which brings it in is the same as in case of the thistle tube—the salt solution inside denser than the solution bathing the cell on the outside. Were the salt solution on the outside denser, as in case of the soil water of a newly reclaimed salt marsh on the seashore, ordinary plants could not feed therein but may starve to death in the midst of plenty. But the plant cell differs from thistle tube cell in having a lining of protoplasm which, while permitting the passage of water by osmosis so guards the passage of the salts which constitute plant food as to let them pass in but one direction through the wall—inward.

TO ILLUSTRATE OSMOSIS IN VEGETABLE CELLS. Knowing the principle of osmosis in plant cells a simple experiment shows how it may be controlled.

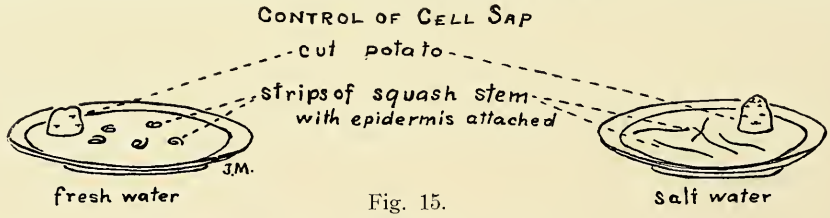


Fig. 15.

Take two plates of water and into one of them put a teaspoonful of a soluble salt, as table salt (No. Cl). Cut a potato smoothly across the middle and note that the cut surfaces fit together accurately. Put the cut surface of one half into the salt solution and the other half into the fresh water. Since the cells of the potato have the salts of plant food in solution those cells in contact with the fresh water take it in by osmosis and that surface becomes swollen and bulges out. But owing to the fact that the salt solution of the vegetable cells is much weaker than the salt solution in the other plate the water will be drawn out of the potato cells by osmosis, causing the half in the salt water to shrink. After twenty or thirty minutes put the pieces together again and note that owing to swelling of one and shrinkage of the other they cannot be made to fit together again.

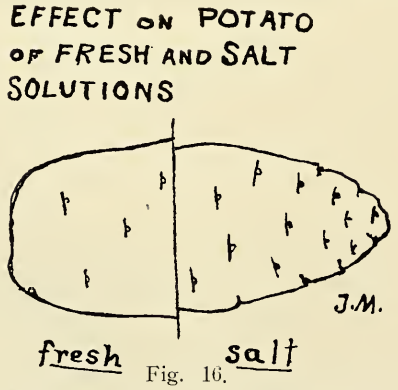


Fig. 16.

For the same reason strips of a succulent young squash stem that have the rigid epidermis attached to one side may be caused to curl up by dipping them into a fresh water solution. But on changing them from the fresh to the salt water osmosis causes the cells to disgorge and the strips again uncurl and become limp. This gorging of the cells of plants makes them *turgid* and the quality of crispness in succulent stems of vegetables is due to the *turgor* of the microscopic plant cells held rigidly within the outer walls of epidermis. Where evaporation from the leaf is more rapid than the taking of water by osmosis into the roots, young plant stems having no other supporting tissue lose their cell turgor and *wilt*.

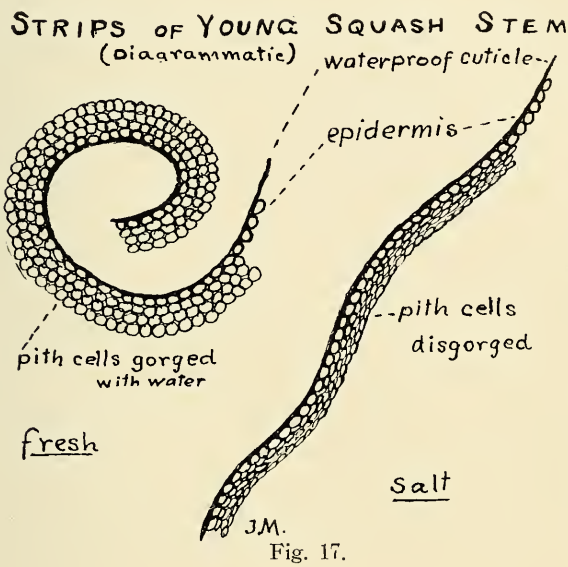


Fig. 17.

MOVEMENT OF FOOD FROM CELL TO CELL. If we consider a number of plants cells whose walls are osmotic and in contact with each other we can readily understand how osmosis will tend to give each the same percentage of salts in its cell sap. And if to this force be added the influence of the protoplasm, which may be continuous from cell to cell, the ability of the plant tissues not only to equalize densities but apportion the total amount of sap in the different cells may be imagined. The seeming intelligence of protoplasm in its power of *selective absorption* of food from outside the cell as well as its control of these movements from cell to cell suggests the fact that while physical osmosis of the thistle tube and pericardium may explain the force which moves these fluids througout the plant, it is the protoplasm that directs all vital activities.

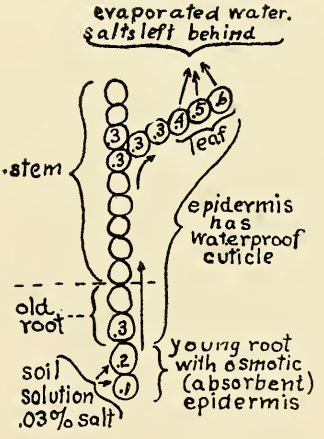


Fig. 18.

Fig. 18 represents a series of plant cells extending from the tip of the root to the leaf. Since the root is in contact with a soil of very low percentage of food salts and since only pure water evaporates from the leaf, we here have a set of influences that tend to destroy the equilibrium of osmotic pressure between cells—the salts tending to become more dilute in the root and denser in the leaf. As a result there is set up the movements of the moisture with its low percentage of food from the soil into the plant, which continues as long as growth continues.

OSMOSIS IN YOUNG PLANT ROOTS. Plants take their N, P, K, Fe, S, Ca, and Mg, from the soil in the form of a very dilute salts by osmosis through the epidermis of the roots. The *epidermis* is an osmotic membrane, being an outside layer of cells whose walls are somewhat stronger and thicker than those of cells lying beneath the surface. In the case of cells composing the epidermis of those parts of the plant above the ground as well as cells of the older roots, the outer wall of the epidermal cells is not osmotic because of the presence of an oily layer that forms a continuous waterproof coat, the *cuticle*, covering those portions (See Fig. 17). Microscopic openings in this epidermis occur in the leaves and serve as *breathing pores*. This waterproof layer compels all the moisture taken in at the root to go to the leaf before it can evaporate into the air. It thus brings in the mineral food from the soil in the form of soluble salts and evaporates from the leaf as pure water, leaving the salts behind in the plant.

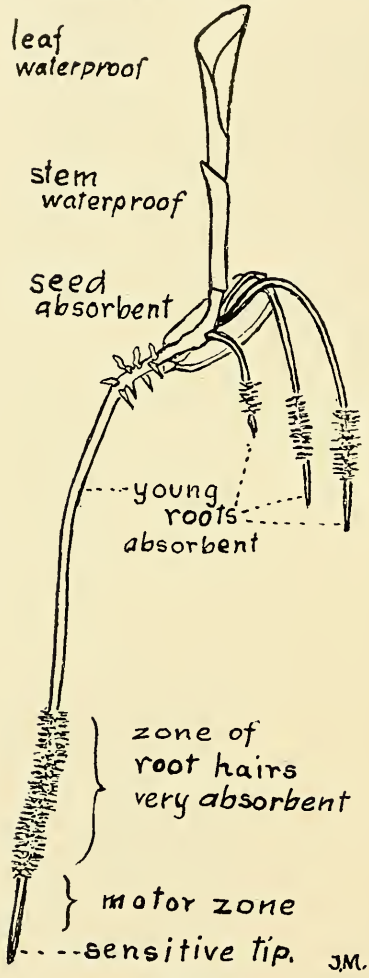


Fig. 19.

TO ILLUSTRATE WHERE THE PLANT TAKES MINERAL FOOD. Dissolve a few small crystals of potassium permanganate in a glass of water. This salt behaves like all others as to osmosis but is especially suited to our purpose because it forms a bright purple stain that darkens the osmotic membrane through which it passes. Submerge in this solution seedlings of corn and of other plants. In ten or fifteen minutes remove and rinse off these seedlings and note that the roots have become discolored with the stain while the stems and leaves, owing to their waterproof coat are not affected. This is a good way to tell how much is root.

Josiah Main

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EDUCATION BY MEANS OF AGRICULTURE.

(Not Necessarily for Agriculture)

The report of the commission (on Rural Life) states that the subject of paramount importance as developed by the inquiries of the commission is education. "In every part of the United States there seems to be one mind, on the part of those capable of judging, on the necessity of redirecting the rural schools. There is no such unanimity on any other subject. It is remarkable with what similarity of phrase the subject has been discussed in all parts of the country before the commission. Everywhere there is a demand that education have relation to living, that the schools should express the daily life, and that in the rural districts they should educate by means of agriculture and country life subjects. It is recognized that all difficulties resolve themselves in the end into a question of education."—Exp. Sta. Record, March 1909.

THE U. T. FARMER

Vol. III. APRIL, 1909 No. 7

RELATION OF THE WEATHER SERVICE TO AGRICULTURE IN TENNESSEE.

There has been a great amount of meteorogical data compiled and published in one form or another and many farmers have been benefitted by their use, but the great majority of those who till the soil for a living either never see these publications, or, seeing them do not know how to make practical use of the data they contain.

It is not the purpose of this article to deal exhaustively with the relation of the Weather Service to Agriculture, but rather to show how the farmer may use the data collected by the Weather Bureau to his advantage. In the discussion of this subject we will consider three different ways in which meteorological records may be of benefit to the farmer. These are: first, in the location of the farm; second, in retermining the crops to be planted; third, in determining the time of planting. The elements to be considered are temperature and rainfall. Under temperature we will consider the dates of the last killing frosts in the spring and of the first killing frost in the fall, also the extreme minimum temperatures. Under rainfall will be considered the annual rainfall and its distribution through the year.

The data used for this article were obtained from the records of the U. S. Weather Bureau. Data were used from between fifty and sixty stations distributed uniformly over the state of Tennessee. The observers at these stations are supplied with standard instruments and have been carefully instructed as to their use by Weather Bureau Officials. The records in most cases cover a period of thirteen years. A few of them are somewhat shorter and several are much longer; notably the four regular Weather Bureau stations at Memphis, Nashville, Chattanooga and Knoxville.

These data can be of great value to the farmer, fruit grower or truck gardener in many different ways, three of which will be considered. First, in determining the location for growing any particular fruit or crop. Any person desiring to establish a peach orchard could learn from the temperature data what sections had the least severe winters and the fewest winters with temperature low enough to injure his trees. He could also learn where there was the least danger from late frosts in the spring. The truck gardener could get information regarding late

frosts in the spring which would be of value in determining the location of his gardens. The farmer desiring to raise a certain crop that requires a long season, 190 to 200 days, would not locate where the average length of the growing season was only 175 or 180 days.

Second, in determining the time of planting by the use of these data the grower of any crop can know, with reasonable accuracy, the risk he runs when he plants at any certain date. If he plants before the average date of the last killing frost in the spring he knows that the chances are against him, while if he plants after that date they are in his favor. Or, if he waits until after the date of the last killing frost he knows he runs practically no risk at all. The farmer desiring to sow late forage crops such as cow peas that are more or less easily damaged by frosts could avoid serious losses by not sowing so late that they would not have time to mature before the first killing frost in the fall. For example, knowing that the average date of the first killing frost in the fall was Oct. 18, he would not sow a variety of cow peas that required 90 days to mature later than July 15.

The rainfall records may be used in a similar manner. For example, the farmer would not plant a crop that requires a great deal of moisture just before a season which was normally dry, and on the other hand, he would not plant a crop which flourished best in dry weather at a time when the records show that it is normally wet.

The distribution of rainfall is also important to be considered when planning the time for plowing, as it enables the farmer to so arrange his crops that plowing time will come at a season when conditions are most likely to be favorable.

Third, these records are valuable in assisting the farmer in determining what crops to plant. Many important crops in Tennessee are grown only in very limited areas. There are three principal factors that must be present to make any crop profitable. They are, proper soil, proper tillage and suitable climatic conditions. As the first two factors are outside the scope of this paper it remains to consider the distribution of some of the crops of Tennessee with reference to climatic conditions and to find whether climate is a factor in determining where they may be grown.

Cotton is an important crop in Shelby and Fayette counties in the extreme southwest and is grown to some extent in a dozen or more counties in that section and in a small area in the southeast portion. Rainfall evidently has no effect in limiting the area of the cotton crop as nearly half of the state has practically the same rainfall and the same distribution through the year. Temperature on the other hand is evidently a limited factor as we find no cotton grown where the mean annual temperature is below 59° F.

Wheat is grown more especially in a few rather restricted areas but

these are scattered throughout the state. It is grown to a small extent in almost every county and probably has no climatic limit in Tennessee unless possibly it is too warm for best results in the extreme southwest portion.

The principal corn counties are Obion, Gibson, Rutherford, Maury and Giles but all counties grow corn. There is no climatic condition in those four counties that could possibly give them an advantage over the rest of the state in corn raising.

Tobacco is grown chiefly in Weakly, Montgomery, Robertson and adjoining counties in the northwest portion and in Greene county in the northeast portion. Temperature and rainfall conditions found in these sections can be duplicated almost anywhere in the Central Basin or in the East Tennessee valley. There is plainly no climatic limit to the tobacco area in Tennessee.

Peanut growing is practically confined to two counties, Humphries and Perry where the rainfall and temperature conditions are very near the average for the state. Again we find no climatic limit to the area over which the crop may be grown.

Irish potatoes are grown on a commercial scale in two very small sections. One is a long, narrow strip extending from Sumner to Giles county and the other is a similar stip extending from Shelby to Gibson county. In these strips we find every gradation of rainfall and termperature conditions to be found in the state except on the Cumberland Plateau and in the extreme northeast portion, where only one crop of potatoes a year is grown. There is therefore no climatic barrier against Irish potato growing in any part of the state.

Early apples are grown commercially in Sumner, Haywood, Maury and Williamson counties and again we find conditions common to all but the most elevated portions. Winter apples however are plainly limited by temperature. The long, warm summer in the greater part of the state matures the fruit so early that it does not keep well beyond early winter. In the Smoky mountains however on the extreme eastern border suitable climatic conditions for winter apples may be found.

Peaches are grown principally in Bradley, Hamilton, Rhea and Gibson counties and are only successful on the more elevated lands with good air drainage. There are however, large sections in West, Middle and East Tennessee that are fully as well situated as far as climatic conditions are concerned as the counties mentioned. The peach crop is more or less uncertain throughout the state because a mild period in winter or early spring is apt to start the buds too soon and a freeze a little later kills them. Damage of this kind, however, could usually be prevented, or at least largely reduced by taking proper steps to protect from the late frosts. Occasionally there is a freeze so severe as to kill the buds before they have started but this is rather unusual.

The principal cantaloupe counties are Lawrence, Lewis, Hickman, Coffee and Franklin. In these counties the rainfall is somewhat above the average for the state while the mean temperature is just about the average and the growing season is short. There are large areas around the Cumberland Plateau and on the Highland Rim where these conditions can be duplicated.

Early cabbages can probably be grown most profitably in Gibson county and vicinity as the season is slightly earlier there. On the other hand, as the cabbage is a cold weather vegetable, late cabbages will probably do best in Johnson county in the extreme northeast as the mean temperature is lower there than in any other part of the state.

Strawberries now grown principally in Gibson, Crockett, Hamilton and Rhea counties could also be grown in nearly every county.

The list might be extended almost indefinitely but perhaps enough examples have been given to illustrate the way in which the study of climatic conditions may be of aid to the farmer in deciding what crops are suited to his conditions.—J. F. Voorhees, '09.

POTATOES.

(From the "Illinois Agriculturist.")

The conditions of storage under which the potatoes are kept have much to do with the vigor of the plants derived from them. Seed potatoes should never be stored in large masses, but rather in moderate sized, slatted bins, or better still in crates, they should be placed where there is a gentle circulation of air and kept at a temperature as low as possible without danger of chilling.

It is a popular belief that has been confirmed by experiments and by experience, that seed potatoes that have been cured in the fall before storing, give uniformly better results than those dug and stored at once. This curing process is simple.

Take the selected seed and place it in shallow crates or even spread it out shallow on a floor where strong light and plenty of air strike the tubers, yet not the direct sunlight. This dries the tubers thoroughly, and at the same time develops chlorophyll, or green coloring matter, in the outer skin. Seed cured in this way produces strong, short, dark green sprouts, not easily broken off, unless allowed to grow too long before planting, comes up more quickly, and seems to produce a more vigorous vine.

The planting of the carefully selected and stored seed should next receive our attention, and the first question most often asked is, "Shall we plant whole or cut potatoes?" We will not attempt to answer this question from our own experience, but rather quote from the work of the New York Station. "Experiments indicate that it is more important to cut the

potatoes into compact pieces of nearly uniform size than to have any definite number of eyes to a piece. We wish to emphasize the need of paying less attention to number of eyes on the seed piece, except to make sure that there is at least one on every piece, and cut out potatoes into good sized chunks, each bearing a large amount of the body of the potato.

"The amount of substance, or body, of potato provided with the bud determines to a considerable extent whether the plant produced is vigorous or weak. If we plant a thick peeling we will secure a potato vine, but we can conceive of no condition where a vine produced under these circumstances could be strong and vigorous, since there has been no food supply of any consequence for it to draw on.

"The total yield increases with every increase in size of seed pieces from the single eye to the whole potato, except where the whole potato is large. The net yield of marketable potatoes increases with every increase in size of seed piece from one eye to the half potato, and the half potato yields the largest net salable crop."

Basing conclusions upon the above facts and upon general practice and experience, it is best, all things considered, to use good sized potatoes for planting, and cut them into three or four ounce pieces. Whether we plant by hand or by machinery depends largely upon the area we intend to grow and the facilities at hand. The main requisite in planting, whether by hand or machine, is to place the seed pieces well down in a thoroughly mellowed seed bed. Four to six inches below the surface after the field has been thoroughly harrowed and leveled is a sufficient depth.

Following planting comes cultivation. As soon as possible after planting, harrowing may begin and this cultivation may be kept up until the young plants begin to appear. As soon as the rows can be followed the cultivator should be started, and this cultivator may be any implement that runs shallow. Shallow level cultivation persistently followed until the vines become so large as to be injured by the horses and cultivator wheels, mellowing the soil and conserving moisture, will more than repay for the labor expended. The old practice of ridging or hilling potatoes has nothing to recommend it and very much against it. The New York station from 1896 to 1902 conducted experiments comparing these two methods of culture and found that in no instance was there any increase in yield where ridging was practiced, but instead the level cultivation yielded from one to 96 bushels more per acre in every trial.

Summing up now all our observations and experience, we find that while the potato crop of Illinois receives little direct attention, it is one of our principal farm products; that the yield per acre is decidedly lower than that in some sections where more attention is given to potato production; that it is possible by seed selection, taking into consideration the vigor and productiveness of the plant, to easily increase our yields per acre and the quality of the potatoes produced as well; that storage of seed

and curing of tubers exerts a considerable influence on the vigor of the plants produced; that yield per acre is augmented by planting uniformly large seed pieces, and finally, that all these enumerated things, together with good care and cultivation, will not only produce more and better potatoes per acre, but will be the means of placing Illinois on a level of production, if not ahead, of the already recognized potato producing states.

We have accomplished much in the way of improvement both in yield and quality with our great cereal, corn; we are already beginning the same work with oats and clover. There is no reason why we cannot, in the same way, and with the same thoroughness improve another of our great food staples—potatoes.—O. D. Center, University of Illinois.

AGRICULTURAL EDUCATION.

An Address at the Tennessee Public School Officers Association Nashville, Jan. 13, 1909.

Motive.

The primary object of public education is citizenship. As schoolmen we have taken upon ourselves the obligation of preparing a citizenship that shall safeguard our liberties and conserve our birthright of natural wealth.

In view of recent disclosures, suspicions, and charges of lack of business and political conscience, and considering the wanton spoliation of soil, mines, and forests, we cannot yet boast of the success of the "American Experiment" nor relax our vigilance in education for saner industrial development and a more enlightened public conscience. We cannot hope to completely purify the stream for rascality and ignorance are a part of our national inheritance and are destined to be for ages to come. But we can see to it that the source is kept sweet and wholesome. And the purpose of the New Education, of which agrciultural education is only a phase, is to get closer to the source of strength of American citizenship than we have sometimes done in making scholarship rather than citizenship the primary object. For while scholarship is an important factor in citizenship it is not the only one.

There are places in our land where commercialism is a dominant influence in the development of citizenship, and the resulting sharp practices in business and politics are openly or secretly admired and emulated by youth. There are places where vast wealth, often ill-gotten, so dominates society that modest virtues are forgotten and true merit has undue obstacles to overcome before it can gain recognition.

I can show you places in our land where the antagonism of capital and labor has divided society into two hostile camps, and strikes, boycotts, lockouts, and black lists have created an atmosphere of hatred in which healthy young citizenship cannot develop.

I can show you areas in which a one crop system of agriculture prevails to such extent as to prohibit the development of attractive rural homes, and to rob rural life of its variety of social interests. And while certain areas, by the beneficience of nature, are so fertile as to cause ignorance of the necessity of conserving fertility, other regions have long since been despoiled of the little original fertility once possessed.

Many places could be found in our land where our sturdy native American

stock is in danger of gradual weakening by admixture with other and less desirable races.

We could any of us put a finger on the exact spot on the map where religious heterodoxy is so prevalent and thrifty as to invite the propagation of every creed that man shall conceive in his heart to create, the evil consequences of which are not the less alarming because delayed.

Contrasting Tennessee with these places we can say that such faults as she may have are on the other side. For probably in no other state is commercialism less felt, wealth less arrogant, or the brotherhood of man more sympathetic. In no other state are agricultural sins more promptly, or inevitably punished by privation and nowhere else are farm surroundings and interests by nature more suited to the maintenance of the ideal farm home. Perhaps no other region cherishes more its racial intergrity and certainly in no other is the faith of our fathers more rigidly and reverently regarded. May not Tennessee take a just pride in choosing, while other states excel in this or that, that her part shall be the preserving and perfecting of American citizenship?

Aspects of the Subject.

The topic "Agricultural Education," is broad enough to admit of volumes being said. The purposes of agricultural education may be considered from either of three aspects—as affecting citizenship, as affecting the industry of agriculture, and its pedagogical purposes.

In the theory of the law no system of public education is defensible that does not have for its prime purpose citizenship. The prime purpose of agricultural education is citizenship.

The most valuable thing that Tennessee possesses is her citizenship and the prime object of the public schools should be to cherish that citizenship. If it is not the prime object of the schools then what is their prime object? If it is not the purpose of the schools then whose purpose is it? And since the fountain head of citizenship is the rural population, the duty of instructing the rural youth how to make the most of their rural environment is a big pedagogical question which it is the task of school men to work out. Thus the *pedagogical aspect* is inevitably involved in any consideration of the subject.

But since bad management and a lack of conservation of natural fertility—never very great in some portions—has made much of Tennessee's agricultural effort unprofitable and unattractive, the average farm is not inviting to ambitious youth as a sphere for life work. To preserve the rural population as a source of strength to the state and nation, for all professions and all time, requires that country life be made both attractive and profitable. Thus the *industrial aspect* is inevitably involved in any consideration of the subject and dictates the content of the course of study for the rural school. Not the small economies but the big ones; food, fertility, profitable plant and animal forms, general character of diseases and pests, conservation of effort, these must have a place in every school course intended to achieve the obect of agricultural education.

Were these remarks addressed to a body of farmers the industrial phase of the subject would be an appropriate object of discussion. Were you a body of teachers merely, the pedagogical phase would be the appropriate one. As a body of thoughtful citizens the relation of agricultural education to citizenship is an appropriate theme. But since the pedagogical phase is the one least appreciated or understood that will be the special theme of this address.

The Pedagogical Phase.

After the successive eras of educational fads which the schools have been

through in recent years, it is not strange to find many excellent schoolmen inclined to a commendable conservatism regarding the new industrial education. And their challenging attitude toward a reform which in the hands of short-sighted enthusiasts might disarrange the whole educational system, to whose principles experienced schoolmen are devoted, is not only excusable but laudable. The principles of pedagogy evolved from years of study and experience are not to be set at naught for a pedagogical creed whose claim for respect is not what it has done, but what it promises to do. For it is significant that industrial education as a reform did not have its origin, nor does it have its largest support with schoolmen, but with the industrial masses, appearing somewhat as an epidemic at widely separated localities. Where the need seemed greatest this remedy was sought. And it is also to be noted that attempts at industrial education have repeatedly failed, and none now in operation is old enough to be past the doubtful stage. But the most significant thing to schoolmen is that after repeated failures industrial, or practical, education comes up stronger than ever. These facts make it the more imperative that the independent and sometimes antagonistic views as to the so-called practical education be compromised on a proper pedagogical basis. And the opposition of schoolmen would doubtless be largely dispelled if there were better agreement as to the proper application of the term "practical."

As understood by the masses, whose vision is naturally not so broad as schoolmen's, it is narrowed to immediate and material good. The use of the term in this shortsighted sense quite naturally condemns such education as insufficient to seekers after "the good, the true and the beautiful," though it may suit a constituency who see in the idea a panacea for social ills. Could "practical" be understood to mean simply something that may be applied and practiced to the advantage of the individiual and the race, immediately and continuously for all time, and that the coupling of such term to the word "education" does not destroy the meaning of the latter, much opposition to a good cause would acquiesce without the compulsion that seems inevitable. And the cause certainly needs the support of all schoolmen to give it this trend and preserve from destruction the ancient landmarks of correct pedagogy. The practical utility of art, literature, and abstract learning, are matters not to be overlooked in the recasting of our educational system. What man does not understand he seeks to destroy, whether it be an art, a creature, or a Savior. The revision of education should be in the hands of its friends.

Cultural Value.

Since agriculture is and must remain the most important vocation for our people, and since its interests touch directly so large a majority, the educator may well ask what there is of cultural value for educational purposes in its study.

We are a civilized people—we think we are. We are advancing in civilization —we claim to be. And if we go back to the time when the race first became entitled to be called civilized we find it coincident (according to Blackstone), with the period when it left off being nomadic and became agricultural. John Fiske dates civilization from the invention of writing and reading, but doubtless these arts were evolved from the necessity for records and contracts of the society which agriculture crystallized and are to be looked upon as results as well as causes of civilization. A race destined to wander from place to place cannot have homes. It acknowledges an allegiance to government no deeper rooted than its own attachment to the soil, and it needs no better form than the patriarchal. It cannot become civilized. But when man at the price of much labor and pains builds a permanent home and plants a crop and grows it well toward the harvest, *then* when the enemy from whom he has been wont to flee to the mountains invades the land, he feels

the need of a strong government, an army, a leader; and foreseeing such need he is willing to pay taxes for protection against that evil day.

Since that early day the race has been chiefly concerned in supplying its material needs through agriculture, and has become more and more civilized. It is a well-recognized fact today that the ownership of real estate and the payment of taxes make for good citizenship. Among other factors of racial progress contributed by this vocation might be enumerated thes[illegible]cess in diversified agriculture is never won at the expense of a rival—the [illegible]may be keen but it is not against a competitor; the constancy of nature's laws to w[illegible]n the farmer is peculiarly related, is a wholesome discipline for the race—"the rain falleth alike on the just and the unjust;" thrift is necessary to prosperity—no wires, no pulls, no influence, can increase the yield of wheat; economy only can provide against winter and drought; intelligence is rewarded by the largest harvests; physical and mental stamina spring eternally from the soil to blossom out perhaps in distant walks of life and later generations. Further enumeration of these trite facts is unnecessary. They are given here seriously, though the line between fact and sentiment is hard to draw and easily lost. History verifies the facts and as for the sentiment the books are full of it.

When the educator discovers a branch for his course of study that inculcates honesty, thrift, patience, foresight, and intelligence, he announces his discovery to his brethren with much ink and speech. Here is a branch in Time's curricilum that has civilized a race and given to it a self-consciousness whereby it is able to understand and classify all things below it, and yearn for all things above. What wonder that a long delayed reform is revolutionizing educational thought from top to bottom, and that industrial education promises even more in the long run for education than it does for the industries.

Sane Ideals.

Industrial education rightly understood has no quarrel with the established subjects of the school curriculum but recognizes them as essential in every complete course of study. And after all it does not differ much in its ultimate aim from the purpose of the established educational system. It is not so much a pedagogical system as a point of view. The goal is the same but the route is new. It proposes to reach that goal by providing first of all a full stomach, a vigorous skillful body, and a healthy mind, to achieve which blessings the school must expand and overflow its present narrow limitations and influence the daily life and industries of the community, because it is in the home that the stomach is filled and health of mind and body secured. And the peculiar industry which provides each home its means of support is not only the best avenue by which the teacher may approach the home, but the improvement of that industry is also the best means of increasing nourishment, health and happiness.

These prerequisites provided, the spur of ambition may be applied by the teacher, always remembering that one cannot by taking thought add a cubit to his stature. Consider the lily of the field how it grows. Its tendencies to development are inherent, and the only thing the husbandman can possibly do is to control its environment. So the healthy young mind needs only suggestions, and he will find his proper sphere, humble or high, and fill it efficiently without the strivings and misfits, or the neglected talent for humble work, all because of the teacher's false conception of what an honorable career is. If the youth who cried "Excelsior" had stopped at the village for supper he might with a fuller stomach and a more vigorous body have scaled the height without extinction; or if a dead hero we must have for example, he could have frozen up at a higher altitude. The forlorn

hope in war may be an admirable and valuable example of heroism but as a steady diet it is a loser. Desperation is the mental attitude of the gambler and criminal. Does not the present educational system, as sometimes administered, attempt to push the youth to his goal by substituting stimulants for food?

The example of self-sacrifice and determination in overcoming obstacles to achieve a noble end will always be an admirable lesson for the young. Shall we therefore ameliorate life by removing the obstacles. The present educational system "saith not;" the New Education says, "Remove all you can. There will always be enough left with which to test character and grade society. Raise the *general* level and increase the difference between man and brute." Success, like wealth, is only comparative after all. The King of the Cannibal Islands would do well to trade homes with the average laborer of our land. The present educational system as sometimes administered offers the same goal to all—a beautiful isle to be reached only by swimming a wide expanse of sea with no resting place for the exhausted swimmers. Fortunate indeed is he who can attain this Isle of the Blessed, and many are they who fail in the struggle. By the route provided by the New Education the youth is at all times permitted to choose between the distant goal and others of easier attainment, and in theory there is one suited to every grade of ability, in which each individual may attain his fullest development of usefulness to society without diminishing the number who attain the highest goal. The New Education does not demand that the intellect blossom out immediately or in a single generation as the gardener ripens his melons for an early market by twisting the vine.

Industrial Motive Dominant.

The student of pedagogy knows that the idea of practical education, is not new in theory, as every considerable writer on pedagogy for the past century has recognized the value of combined and correlated training of mind and hand which has been offered by industrial pursuits since the dawn of civilization. Even Squeers understood enough pedagogy to combine botany (b-o-t-t-i-n-n-e-y) with weeding the onions. But the pedagogical value is apparently little suspected by some of the strongest advocates of the reform and has had little to do as yet with the present overwhelming tide toward industrial education. To them it means an amelioration of their immediate material conditions by increasing the industrial efficiency of youth, and the educational reform might still be in "innocuous desuetude" had not the far-sighted Senator Morrill of Vermont set the thing going in 1862 by providing in his bill the sinews of war through National appropriation.

The Philosophy of It.

But after all the psychologist will as usual have to be accorded the final word on this subject before we can rest easy about it. And we shall expect him to say something like this:

"In infancy the child is but a savage mentally and every child must start from the same beginning that his earliest ancestors started from. Thence his development to maturity carries him through all racial stages that his ancestry passed through. As the race progresses higher and higher, and is removed farther and farther, historically, from its beginning, it is necessary to lengthen childhood and to crowd it more and more with racial experiences. And since each child must pass through all these stages of tree-dweller, cave-dweller, savage, barbarian, nomad, hunter, shepherd, and farmer, psychologists recognize that he should have all the help available in filling to the fullest extent each of these successive stages, if he is to arrive at maturity an educated being and be projected into his future with the largest possibilities for racial good. Hence, provide him by literature, art, and

environment, with trees, caves, tents, basketry and weaving, bow and arrows, sling, and spears, as well as with Hiawatha stories, Old Testament biographies and Greek heroes in those early years corresponding to the age, antedating history, when the human mind was groping its way toward the light. These experiences the home and kindergarten should supply."

"The nomadic stage safely passed, the child is ready for agriculture and reading and we put him into school where the school garden, which every writer on pedagogy of any note has advocated and which as yet so few of our schools provide, makes a citizen of the nomad." Here are some of the lessons which the school garden may teach him: He who plants a garden by that act promises the world that it shall be kept in a husbandman-like manner, for a garden full of weeds is like a man of words and not of deeds. Plants are dependent upon man for their care, rewarding with a harvest him that is kind, but withholding the reward from the negligent farmer. Weeds are like bad habits, which once rooted are harder to eradicate, the longer they are allowed to grow—starving and choking out our better selves. The teacher whose austere and business-like school-room methods, rules, and restrictions are apt to induce instinctively an attitude of opposition in the erstwhile nomad, is found in the school garden, on better acquaintance, to be companionable, helpful, and sympathetic—rejoicing with the harvest and lamenting with the mishaps; condemning laziness, vandalism, and selfishness, and praising thrift, helpfulness, and regard for the rights of property, with the justice of Solomon and the approval of all, and the youthful citizen learns for the first time the necessity on which government is founded.

The school garden may also yield one of the greatest pleasures which the home of wealth often denies—the appreciation of a good dinner after manual labor. The school garden offers the opportunity to the child of acuqiring scientific knowledge first hand by the only method by which the world's stock of knowledge has been accumulated—observation. And finally, it offers a means of expression for one's talent for order and economy of arrangement and aesthetic tastes. All the foregoing purposes of the school garden are independent of its strictly agricultural purposes and possibilities.

Human beings have two modes of expression, by words and by deeds. Any jury in the land will consider man's deeds better evidence than his verbal testimony of his intentions where the two are at variance, and we have the proverb "Actions speak louder than words." Does not our educational system sometimes put too much stress on rhetoric while the world has learned to appreciate more highly him that "keeps still and saws wood." Are not our schools for this reason sometimes responsible for our Sentimental Tommies, whose highest ambitions develop no further than their formulation into unexpressed rhetoric?

High School Agriculture Faces the Future.

These fundamentals which the agriculture of the past has taught the race the elementary schools of today should utilize in developing character of youth so far as the school can utilize them. And no pupil of the elementary school should be permitted to return to the farm for his life's work without a knowledge proportional to his capacity of the great agricultural leaks through which the farmer's profits are lost. Beyond that point we turn and face the scientific agriculture of the future, in which the high school shall train the son to outstrip the father in skill and knowledge. Here in the high school the motive changes and the cultural value of all industrial courses lies in their utilization of materials, minerals, soils, plants, animals and foods for the teaching, by the laboratory method, of science heretofore taught theoretically from books or at best from prepared laboratory specimens.

Granted that the sciences—physics, chemistry, geology, physical geography, botany, zoology, and physiology, are of value in our high schools and colleges; and admitting that they must be retained as "cultural" subjects, advocates of industrial education would for illustrating them utilize the familiar materials of home, farm, and shop, serving thereby the needs not only of those who expect to follow professional or non-industrial careers, but also the great majority, who are destined to deal with such materials in their daily work for a lifetime.

Necessity of Compromise.

Should the pupil who studies a science for its cultural value and the one who studies it for its utilitarian value be put into the same class? Here is where the compromise must come if we are to avoid all the evils a dual educational system,

for there can be no doubt that industrial education has come to stay. When we consider that every important order of plants and animals has representatives of great economic importance, and that the principles of chemistry and physics have economic applications in the arts, we realize that the study of science for cultural purposes may as well be illustrated mainly by materials that the industrial student must use; and when we realize, on the other hand, that no fact or principle of science, and no organism, plant or animal, however abstract or insignificant today but may, by some invention or change of environment or adaptation, become of the greatest economic importance tomorrow, we see that a common ground of agreement is quite feasible.

And when we reflect that the industrial student needs a broader vision than could be obtained by providing for his immediate needs, while the student who seeks culture can not get it by leaving out the necessity for applying in some way, every bit of knowledge he acquires—in other words, that nature will not be cheated—we will admit not only the possibility but the necessity of having both classes of students working together in the high school to correct each other's tendencies to unsymmetrical development. The high school is given special consideration here because, while the rural elementary school is the goal which we seek, the high school is destined to become the rural teacher's training school and is the only practicable route by which the rural schools as a body may be reached.

Furthermore it is only in the regular established high schools, alongside regular classes in mathematics, language, etc., that agricultural subjects can be standardized and given a definite pedagogical value. Where the industrial purpose predominates over the pedagogical, agricultural courses in the high schools are still outside the course of study as conceived by the schoolman, and formulated in terms which he cannot appreciate. It behooves the schoolmen to take a more active hand in this reform and make agriculture measure up to the present pedagogical standards or forever after hold their peace, as the industrial motive is the aggressive one and is at present commanding the funds.

JOSIAH MAIN.

PERSONALS.

Mr. Joe C. Clark left the University at the close of the term just ended.

Mr. W. E. Grainger has accepted a position as chemist with the Sanford Day Iron Works and succeeding him comes Mr. W. K. Hunter.

Mr. Scott is taking a course in Dairying at the University Farm, preliminary to taking charge of that department at the West Tennessee Experiment Station.

Mr. A. T. Anders, '07, who has been at the Experiment Station for several months working out cotton estimations in connection with some cotton experiments which are being carried on by the Government under the supervision of Professor Bain, has but recently gone to the new Experiment Station at Jackson, Tenn., there to take charge of and continue these experiments.

A DEPARTMENT OF COUNTRY LIFE.

The commission (on rural Life) points out, and the President concurs in the conclusion, "that the most important help that the Government, whether National or State, can give is to show the people how to go about these tasks or organization, education and communication with the best and quickest results. .This can be done by the collection and spread of information." The President urges that "it is of the first importance that the United States Department of Agriculture, through which as prime agent the ideas of the commission stands for must reach the people, should become without delay in fact a Department of Country Life, fitted to deal not only with crops, but also with all the larger aspects of life in the open country."—Exp. Sta. Record, March, 1909.

EDITORIAL.

The Country Life Commission.

There has recently come to our hands a detailed report of the Country Life Commission appointed by President Roosevelt several months ago for the purpose of investigating conditions of country life in general, with the view of pointing out opportunities which have heretofore been unappreciated by the average farmer. The appointing of this commission has caused much comment from different sources some of which has been inclined to depreciate the value of such an undertaking. But this was due to the fact that the true purpose of the Commission was not understood. As they state their purpose was not to try to help the farmer to raise larger crops, but rather to show him the possibilities of country life. There was never a time when the American farmer was better off than he is today but there has been a complete and fundamental change in our whole economic system within the past century. This has necessitated marked social changes and although in some occupations the readjustment to these new conditions has been rapid such has not been the case with farm operations. Back of the whole agricultural system there lies a structure of tradition which has offered much resistance to improved methods. Broadly speaking, agriculture is enjoying a most prosperous condition but in spite of all this progress it is not as profitable as it is entitled to be for the amount of energy and labor expended and the risks which the farmer assumes.

The Commission had at their disposal only a limited time, hence their methods of procedure required very careful planning. In pursuit of their object one of the most fruitful means was a circular of questions distributed over the country asking for expressions and opinions of the people themselves on the main aspects of country life. To these inquiries about 115,000 persons have already replied showing the evidence of interest of the people themselves. Besides this the Commission made a tour of the country including in their trip all the cities that their time would allow. On this trip hearings were held at 30 places and they were welcomed by appreciative audiences at each stop, the halls sometimes being filled to overflowing. In attendance at these meetings were often to be found governors and state officials but the bulk of the speakers and audiences were country people. The suggestion of President Roosevelt that the country people meet together in their district school houses met with compliance in a great many instances and reports of meetings have been received from almost every state already. A review of the problems and suggestions obtained by these different methods of inquiry has shown the number to be very great. So great that they must necessarily include in their report only those of greatest significance and those which call for most immediate action. Of these problems they present the lack of education as being the greatest single deficiency. This is truly of paramount importance because to

improve any situation the underlying situation must be understood. There is needed not only a fuller scheme of public education but a new kind of education adapted to the real needs of country people. The greatest defect in the public school systems of the country has been in the fact that the whole tendency has been to direct the mind of the child away from the country into a business career rather than to show him the opportunities of an agricultural calling. Furthermore there came to them many complaints of unfair treatment by organized and corporate interests. In fact there exists a general disregard of the inherent rights of the people who work the soil. Large manufacturing, merchandising and transportation companies take advantage often of the farmer, and great impositions are perpetrated. For the correction of this evil, we, as a people, first need to recognize the necessary rights of the individual farmer to the use of the native resources and agencies that go with the utilization of agricultural lands and protect him from hindrance and encroachment in the normal development of his business; secondly the government, state and national should assume an attitude that will safeguard the separate and individual rights of the farmer in the interest of the public good. Mention is also made of the need of better highways throughout the country, of the sad effects of soil depletion, many instances of which are shown in deserted farms, and of the agricultural labor problem. Each of these deserve immediate attention. Two other things their investigations have brought to light which are of much importance are, the degree of healthfulness, and the work of women, in the country. Theoretically the farm should be the most healthful place one could live, but a lack of attention to sanitary problems results often in very unhealthful surroundings about many farm houses. The condition of women on the farm in many instances is all that could be desired but there are many farm homes yet in which the women live lives of continual drudgery, due to a lack of sufficient help and of the use of modern home appliances.

These deficiencies are not to be charged against the farmers as a group but are rather to be looked upon as an evidence of an unadjusted society. Teachers have placed too much emphasis upon the renumerative and productive side of country life. There is a great need and a great opportunity for teachers in the country today who can point the farmer to the greater possibilities which are within his reach and any young person searching for a life work will do well to consider the advantages offered for the uplifting of humanity and the lasting betterment of his country by such a choice. We are led to conclude that the work of the commission has been decidedly successful and predict that it is the beginning of a series of investigations which shall cause the readjustment of society so that the farmer may occupy the position of aristocracy to which he is justly entitled.

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made rather late and the season due to drouth, was unfavorable for germination of small seeds. The above comment applies particularly to the oats, alsike clover and vetch. As winter covers, rye and crimson clover proved far superior to the other crops because they grew through the fall and winter thus forming a protection covering at the time it was most needed. Of the two, crimson clover would seem to be the first choice as it is a legume and will thus add nitrogen to the soil, and as the cost of the seed used per acre is less. Vetch was unsatisfactory because it did not grow but very little until this spring, thus was of little value in holding the soil during the winter rains. Earlier sowing would of course help to obviate this objection, but even then rye and crimson clover would have the "lead." The same criticism is made of the combination of oats and vetch that has been made of vetch alone. Due to the late sowing and the drouth the alsike clover was a complete failure.

This spring the orchard is being plowed and harrowed, and alsike clover and red top are being sowed. Although the seeding is being made somewhat late, the excellent seed bed gives good hopes of success. As these two plants are perennials, a good "stand" will mean a comparatively permanent cover. This is what is wanted in this orchard on the hill side, for the trees are now well established, most of them having been set nine years. The plan is to cut the clover and grass once a year and leave it on the ground as a mulch.

This will be what is known as as the "sod mulch" system. In this way erosion will be reduced to a minimum, the land will be built up in nitrogen and organic matter and the expenses of caring for the orchard will be reduced.—L. R. Neel, '07.

BACTERIA IN BUTTER MAKING.

In the February issue of the "Farmer" an attempt was made to show some of the more potent causes of inferior milk from the stand-point of bacteriology, and some of the means of procuring and marketing a better product. It was there seen that bacteria are the direct cause of the souring of milk and that the sweet milk dealer should maintain a condition which would keep the bacterial count as low as possible. In the production of butter, however, the requirements are almost the reverse, for cream will not ripen without the aid of bacteria.

It is, of course, well understood that cream may be churned and butter secured without the ripening of the cream, but butter produced from sweet cream lacks many of the desirable qualities which the ripened cream butter possesses.

In the outset it should be borne in mind that butter is eaten as a relish rather than for its food value and when it does not have the proper flavor and aroma,—which are both due to the ripening processes which take place in the cream—it does not readily find sale and must be sold at a somewhat lower price than that having these desirable qualities.

There is considerable variation among the different countries with regard to the choice of flavor in butter, but the people of this country

generally prefer a butter having a decided flavor and aroma. For this reason it is impossible to supply the most desirable grade unless the cream be properly ripened.

The ripening process was originally the outcome of the production of butter on small farms where it was necessary to accumulate the cream of several days in order to have a sufficient quantity for a churning and during this period the cream would not remain sweet. When the large plants for butter-making were established, however, sweet cream could be secured in large quantities and churned sweet, but for reasons given above this was not found profitable and at present the cream is almost universally ripened.

An object very much to be desired, and sought by creamerymen is a process which can be relied upon for uniformity of product. This has received much attention not only of the practical butter-maker but of scientific men as well who have interested themselves in the problems of the dairy industry and who have spent a great deal of time and mental energy upon the question.

For several years it has been recognized that this is a bacterial problem and what has been accomplished has been done by men working along this line.

Butter produced by the small farmer is rarely an approach to uniformity; one churning may be excellent while the following may be a very inferior quality. In this case the ripening of the cream is left to such bacteria as may get into it by chance and no one can predict the result. It is, of course, true that almost always some of the desired types of bacteria will be present, for they are very widely distributed and practically always present, but they are often not in sufficient numbers to control the souring process and the butter will be lacking in some of the more desirable qualities.

When the creamerymen undertook the making of butter on a large scale they at once saw the necessity of controlling the ripening process rather than trust to mere chance, and therefore, turned their attention to the control of the bacteria which ripened the cream. In an attempt thus to govern the process of cream ripening at least three factors are to be taken into account.

1. Regulation of temperature. If the temperature is kept too low the lactic acid bacteria will not grow well and the result will be determined largely by forms whose development will take place at the low temperature but whose products are far less desirable and which will probably produce great defects in the butter. If, on the other hand, the temperature is too high the gas producing organisms will be especially forwarded and the result unsatisfactory. It appears that a range from 65° F to 70° F is most favorable to the ripened process.

2. Starters. The use of starters has become very general with butter-makers and is found to be of the greatest importance. By this

means a great number of the lactic acid bacteria are added to the cream which, because of their numbers and the acid produced by them, can control the entire souring of the cream. Many efforts have been made to isolate single species of bacteria and find one which added to sterile cream would alone produce the desired changes, but so far no single form has been found which would give satisfactory results. If such an organism could be found the whole matter would be greatly simplified and absolute uniformity could be depended upon, for the other factors could then be so regulated as to make the results certain; the cream could be sterilized, the temperature uniform and the time of ripening definite. So far, however, this is not possible because of the lack of a bacterum capable, when in pure cultures, of effecting the proper chemical changes in the cream and the usual practice is to add more or less composite cultures to the cream as it is secured without sterilization.

There are at present two general ways by which starters are secured. First, those known as home-starters, and; second, commercial starters. The home-starters are secured by selecting milk known to be of good quality, placing it in sterile cans, keeping at 65° F to 70° F until it is thoroughly sour but not curdled. It is then ready to add to large quantities of cream as a starter. It may of course, be unfit for its intended purpose, as the proper germs may not be present for they must originally find their way into the starter milk by chance. If this is the case, the butter-maker must simply try again and continue until he has secured what he is looking for. When the proper types are once secured it is an easy matter to retain them and propagate by transfering some of the sour milk to new milk from time to time. This process has, on the whole, been found quite satisfactory and is largely followed.

Commercial starters. In the laboratory the bacteriologist attempts to do for the creameryman what he does for himself when making home starters. He isolates in pure cultures, distinct types of lactic acid bacteria and prepares them for delivery to the butter-maker, who, instead of experimenting for his starter, simply adds these pure cultures to his milk and is sure to have at once the proper types with which to work. Many difficulties were met in the original attempts to supply pure cultures but at present they have been practically all overcome and commercial starters are very satisfactory. They are distributed either as a powder or in tubes of bouillon and should be used soon after they are prepared or they may lose their power to act; for we must remember that we are dealing with living things capable of being killed by adverse conditions. They soon die when thoroughly dry or when subjectd to direct sunlight, heat, chemical agents, etc. When commercial starters are once introduced into the milk they are subsequently treated exactly as home starters.

3. Time of ripening. As the cream is now supplied to the creamerymen it is not impossible to completely control the time required for ripen-

ing; nor in fact, to entirely govern the other factors concerned in the souring process. When the cream reaches the creamery the various supplies are of different ages and purity according to the methods used by the different persons supplying it. In the warm weather it is likely to be more or less completely soured; in winter, more likely to be quite sweet, but as stated before its condition will depend upon the dairy methods employed by those who secure and handle it. It would, of course, be much better if the entire supply could be uniform in character and improved methods of dairying are constantly approaching a condition which will approximate this more fully as the subject is better understood.

Many of the defects found in butter are traceable to the presence of certain types of bacteria, but in general it is probable that such defects are less numerous and even less serious than those due to chemical and enzymatic causes. Red spots are probably caused by the presence of Bacillus prodigeosus, blue spots to Bacillus cyarisus, yellow spots by Bacillus aurescense, etc. Rancid, putrid, lardy, fishy and oily butter is often due directly to bacteria or moulds.—Maurice Mulvania.

TUBERCULOSIS IN RELATION TO THE FARM.

Tuberculosis has an important relation to the farm, since it is a contagious disease effecting man, cattle and hogs, and is produced by a bacterial organism, the tubercle bacillus, which is invisible to the naked eye. This disease is never produced spontaneously but only in the presence of this organism which is easily carried through the air on dust particles. It is not spread as rapidly as blackleg, cholera, etc., but spreads continually until throughout the herd after once introduced.

There are two forms of tuberculosis found both in man and domestic animals, generalized, and localized tuberculosis, differing only in the degree of the disease. Generalized tuberculosis is a case where the lungs, intestines, glands, liver etc., are affected by the disease, while localzied tuberculosis is a case where only one organ is involved as in the case of pulmonary tuberculosis, where the lungs are affected, or intestinal tuberculosis, where the intestinal tract is affected. A localized case will develop into a general form in the course of time, as the organism can be carried through the body by the blood system and the lymphatic system.

This disease can be contracted in four ways: (1) through the respiratory tract, (2) through the intestinal tract, (3) by inoculation, and (4) by heredity. As for the first it is the commonest mode of the spreading of the disease, since the germ is very resistant and will live from 8 to 9 months in the air. Cattle affected with pulmonary tuberculosis and consumptives both throw off the germ from the system in coughing. Special care must be given to the handling of the sputum of a consumptive, as it will remain virulent from 8 to 9 months. Controlling the spread of the disease in cattle is effected by housing cattle only in properly ventilated barns. Another mode of infection is through

the intestinal tract. This is a common occurence in calves and also in children especially as the child's principal diet is milk, and to prevent this, all milk should be sterilized. The watering and feeding troughs are common sources for carrying this germ and making it easy for the germ to be introduced into the digestive tract. The inoculation of the germ into the system by an abrasion of the skin or cut or wound will produce the disease and it occurs especially in butcher's in the form of the "butcher's warts." These warts are only localized cases of tuberculosis but some have developed into general forms, even producing pulmonary tuberculosis. As for the last named mode of infection, namely heredity, it is not really a means of infection because the disease itself can not be inherited but a certain degree of susceptibility to the disease is transmitted. Therefore children from tuberculosis parents must be protected from the germ of this disease.

The tuberculosis germ in cattle can produce this disease in hogs and in man and this is the place to begin the eradication of the disease. The first thing to do is to detect the disease if present which is a very difficult proposition if one has to rely upon the physical symptoms. But there is one easy and sure way of detecting it and that is by the tuberculin test. The tuberculin test consists of taking the temperature of the cattle 2 or 3 times at regular intervals, the day previous to the injection of the tuberculin and then taking the temperature for 24 hours after at regular intervals. The tuberculin is obtained by growing the organism obtained from man in a certain media for several days, and then boiling it down to 1-10 of its original volume which kills all the germs. It is then filtered and the soluble residue is taken and diluted with glycerine and a disinfectant, then bottled and is ready for distribution. One teaspoonfull of the tuberculin injected by a hypodermic syringe under the skin just behind the shoulder of the cow will give the test. If the injected animal is in normal health there is no more effect upon the system than would be expected from the injection of sterile water, but if the animal is tuberculous, a decided rise of temperature will follow. The normal temperature of the cow varies from 101° to 103° and if the temperature gradually increases up to 105° or 106° F and then slowly decreases, then the animal is tuberculous. The cause of this reaction is because of the fact that when the tubercle bacillus grows in an animal it acts upon the tissues of that animal and forms certain poisonous products in the body, and by the addition of more of these poisonous products as in the injecting of the tuberculin, fever is produced. But if there are no organisms present in the body, the injection of the tuberculin produces only a local fever at the place of injection and does not affect the entire system. This tuberculin does not produce immunity nor cause any harmful effects upon the animal.

Next after the detection of the disease, comes the control and eradication which is done by the separating of the tuberculous cattle from the other cattle in the herd, and the disinfection of the barns, feed lots, etc. The best manner of disinfecting in to scour and clean all wood work and white wash the barn with white wash containing formalin or carbolic acid. The diseased cattle

should then be killed unless they are kept for breeding purposes, which should not be unless they were valuable pure bred animals, for as long as they are alive, they are ready means of spreading the disease. Of those that have only a localized case of tuberculosis, a part of the carcass can be used, thus giving some returns, but if they are held back, a general case may develop later which will make the animal practically worthless. The well cattle should be tested again in about 3 or 4 months. The above methods of controlling the disease is for the farmer, but the state should also aid in this. Some states have laws prohibiting the shipping of tuberculous cattle into the state but all states do not and these that do not are made the dumping grounds of all diseased cattle. But the time will soon come when all states will have these laws and put them into effect. No cattle should be bought at the present time unless subjected to the tuberculin test and found free.

The next most important animal on the farm susceptible to this disease is the hog, and hog raising generally goes in connection with dairy or beef farming. The most common mode of the contraction of the disease in hogs is from the milk from diseased cows and from the droppings of tuberculous cattle. This occurs through the intestinal tract and the hog is generally killed before a case of generalized tuberculosis is produced. But still it is important especially in the inspection of meat. Sooner or later the packer and slaughterer are going to buy hogs subject to post mortem inspection, as they are at present doing in some of the large packing centers. And when this is universally done the intelligent raiser will get more for his healthy hogs than he does now and the ignorant or careless breeder will get less for his tuberculous hogs, as he should. Two laws carefully followed out will keep the hogs free from tuberculosis. (1) Scald all milk and raw products fed to hogs and (2) let hogs feed behind cattle only when the latter have withstood the tuberculosis test.

The final eradication of this disease in cattle and hogs will decrease the spread of the disease in the human family. The tuberculous germ found in milk from tuberculous cows will produce this disease in man, especially in children. Therefore all milk subject to this infection should be sterilized before being used for food. The larger cities control this to a great extent by the milk inspectors, who make a test of the milk delivered into the cities, for the number and kinds of bacteria in the milk. Also the cities are controlling the meat supply, by the meat inspectors inspecting every animal that is slaughtered. If the animal is affected by a generalized case of tuberculosis the whole animal is condemned, but if effected only by a localized case, only that portion affected is condemned.

As was stated above, the time will soon come when all breeding cattle will be purchased subject to the tuberculin test, and all cattle and hogs slaughter will be purchased subject to post mortem inspection, so it behooves every farmer to begin to eradicate this disease from his own herd now.—G. R. Worthington, '10.

CONQUERING HOG CHOLERA.

(From the "Illinois Agriculturalist.")

Is Hog Cholera Preventable? This is the vital question among the swine growers and breeders the world over. In Missouri alone the losses from this dreaded disease mount upwards in the millions, and in the United States some authorities estimate the loss at something like a hundred million of dollars. It is no wonder that swine men should be asking for the solution of a question that affects so vitally their pocket books.

The veterinary department of the College of Agriculture and Experiment Station at Columbia, Missiouri, have been having excellent success with hyper-immunized hog cholera serum," which is produced on the station farm under the supervision and direction of the experiment station's veterinarian, Dr. J. W. Connaway. After the discovery by Dr. M. Dorset and his associates of the Bureau of Animal Industry, Department of Agriculture, Washington, D. C., that the "Hyperimmunized Serum" has protective properties, Dr. Connaway of the Missouri experiment station was solicited by the Bureau to confirm their results, co-operate with them in perfecting methods of producing the serum and in putting its production upon a practical basis. Dr. Connaway will be remembered from his work with Texas fever; it was he who worked out the practical details of this fundamental and far-reaching discovery—the method of inoculation of northern cattle shipped to Texas against Texas Fever. Today cattle are sent to Texas without fear of the Texas fever. All that is neeessary is that the cattle be inoculated before exposure to the Texas fever infection and thus immunized against the ravages of this fatal malady. The prevention of hog cholera is somewhat similar to the prevention of Texas fever, so that Dr. Connaway is greatly aided in his hog cholera work by his previous valuable experience with Texas fever inoculation.

Within the last eight months over fifty herds were vaccinated in Missouri against cholera, and with the exception of one herd every herd owner was highly pleased with the results accomplished. And this one herd was vaccinated with a rush order serum which had not been tested at the station, because of the urgency of the call. The herds inoculated were for the most part pure bred and furnished excellent proof of the possibilities of the serum.

A prominent Berkshire breeder, Mr. Thomas Richards, of Vandalia, Missouri, who had his herd inoculated after a virulent attack of cholera has this to say in a recent letter to the experiment station: "My experience has been that if hogs are treated before being exposed to the disease that they may be exposed to any amount of cholera afterwards, and that not over three per cent. will die. I may be over enthusiastic about hog cholera serum as prepared at the experiment station, but after losing over eighty head with cholera in less than thirty days, and them finding a remedy (in the Missouri station serum) that has since saved me ninty-five per cent. of all hogs treated, either aged hogs or little suckling pigs, I feel justified in being enthusiastic." In a later letter he writes: "Since you were here in June all the hogs treated have been well and hearty. These hogs were running on infected pastures. I have turned

sixty head more on infected pastures, inoculating before turning on, and have lost but five per cent."

A well known Poland breeder of Jackson county says concerning the hogs inoculated for him: "None of the hogs which were not off feed at the time of inoculation have been off feed since. On the whole I am very much pleased with the results of the inoculation." In the herd of a Cass county, Missouri, breeder not enough serum was available to inoculate the whole herd so only a part was treated. He writes: "Since part of our herd was inoculated we have lost twelve pigs by cholera, but only one of them was vaccinated. Nine other vaccinated pigs running in the infected pens are all well."

The show herd of Mr. Debow of Nashville, Tennessee, contracted cholera while on the show circuit. His herd was sick, many had died, and in this condition vaccination was tried on both the sick and those outwardly well. His faith in the serum is expressed in a letter as follows: "Inoculation saved six of my fine brood sows, and also two of my best boars. I am sure that if you could have vaccinated all my show herd before I started on the circuit that none would have ever gotten sick. I hope to inoculate all before I start on the show trip next year."

One can readily see from hundreds of statements such as these picked from the mass of correspondence that the serum has been remarkably successful, and this under most trying conditions. The herds treated were without exception badly infected with cholera, both sick and well pigs being treated. Experience teaches us that the loss of well hogs after inoculation, even though exposed to the disease in a virulent form, is very slight. Fifty-nine (59) well pigs running in infected pens, Columbia, Mo., were inoculated with the "hyperimmunized serum" and of this number but three succumbed to the disease. Nearly all the "check" pigs died. In this particular instance a loss of but 5 per cent. was experienced, or a saving of about 95 per cent., which speaks well for the potency of the serum. Inoculation of sick pigs already down badly with the cholera, has not been attended with successful results, although in most cases where the disease has not gone too far, some benefit is noticed in that death is delayed and quite a number recover. This leads us to the conclusion, therefore, that the great value of the serum acts as a preventive" rather than as a cure. But this is worth millions to the swine growers of the United States. That the treatment has the faith and backing of the owners of the herds in which it is tried is certainly a good criterion of what it will do.

As to the method of procuring this effective serum: To date, the hog has been the only animal from which the immunizing serum has been successfully produced. A hog that has naturally passed through the disease, or one that has been inoculated with a good dosage of the hyperimmunized serum is taken and is injected with gradually increasing doses of hog cholera virus from appropriate cholera cases. In about sixty days this hog is completely immune from this disease. It will now withstand an amount of virus sufficient to kill hundreds of unvaccinated pigs. This "hyperimmunized" hog's blood is now

ready for the making of the serum. The pig is securely tied to a table, and under strictly aseptic conditions, everything sterile, he is bled from the tail into a sterilized vessel. This bleeding is repeated at intervals of a week to ten days—the strength of the serum being tested, and the animal reinforced with fresh virus when necessary; finally the pig is killed and the remaining blood secured.

The blood thus secured from the "hyperimmunized" pigs is "defibrinated," that is, the clot is removed. A small quantity of phenol or other like preservative is added to the serum by which means it may be preserved almost indefinitely. It is the fond hope of Doctor Connaway that he may some day find a more practical method of securing this serum, and with this hope in mind he is working and experimenting along that line. Some experimental work has been done with the ox, and horse, but these animals have not as yet yielded a reliable serum. Under the present method of producing the serum from the hog many difficulties of manufacture arise, the main drawback being that the hog will yield only about 30 to 500 doses.

The process of treatment is comparatively simple. The herd to be protected is entered and the pigs caught, one at a time and "vaccinated" by the injection of the "Immunizing Serum" into the ham of the pig in dose of 20 cubic centimeters to each pig under a hundred pounds weight and 20 cubic centimeters for each hundred pounds additional weight. But one inoculation is necessary.

Now that the possibility of the production of a preventive for hog cholera is no longer doubted, and that this "Immunizing Serum" is wonderfully effective, it is no wonder that a number of commercial hog cholera serum or "cholera preventive" concerns are on the market with their product. It is the old, old story of the "Mummy wheat seed," "Sandhill Cherries in Masquerade," when it comes to leading the farmer into some new "Gold Brick Scheme." Beware of extravagant claims for any sure cure nostrum. Write to the national department of agriculture, or to your own experiment station before investing in something worse than worthless. Doctor Connaway asked for a statement in regard to the foreign vaccine called the "Bruschettini Hog Cholera Vaccine," an Italian preparation distributed by a Chicago agent, and gave this bit of experience: "We have inoculated several herds that had been previously vaccinated with the Bruschettini Hog Cholera vaccine. In these herds, and in a large number of herds in the neighborhood this foreign vaccine appeared to have been a failure in the way of prevention. In one herd where the owner had already lost half of his hogs, we used the 'Immunizing' Serum on the remaining pigs, twenty-eight in number, and of these but one died, and this, notwithstanding the fact that all these pigs continued to run on the infected premises.

Official experimental tests of this same Bruschettini vaccine have been made by the bureau of animal industry of the U. S. Department of Agriculture and they show that this vaccine has no protective properties against hog cholera or swine plague. A report of the bureau's findings is to be found in cir-

cular 27, office of the Secretary, United States Department of Agriculture, Washington, D. C. The moral to the farmer is obvious, "think twice," and then investigate thoroughly before you invest.

There is no reason why hog cholera should not be handled just as any other contagious disease, that is, at state expense, as the control of this disease is of concern to all the swine raisers of a community and not merely to the individual owner who may be losing hogs from the disease. The farmer having the cholera on his place should notify the authoritives and they should take charge of the outbreak, sending a skilled veterinarian to give proper advice in regard to disinfection and quarantine measures and by judicious use of the "Preventive Immunizing Serum" prevent a widespread outbreak by stopping the disease on the spot.—John Evvard, Uni. of Mo.

There are two methods of vaccination, one in which the serum alone is used, which produces an immunity lasting 3 to 6 weeks; and one in which the serum is used in conjunction with 2 to 3 c. c. of fresh blood obtained from a hog sick with hog cholera. This latter method is known as the serum-simultaneous method and produces an immunity which is considered practically permanent. When injecting in the second method it is best to use separate syringes, injecting the serum in one thigh and the virulent blood in the other. The serum from a hyperimmunized hog also possesses some curative effect when used very early in the disease. There is little or no danger in spreading the disease when vaccination is properly carried out.

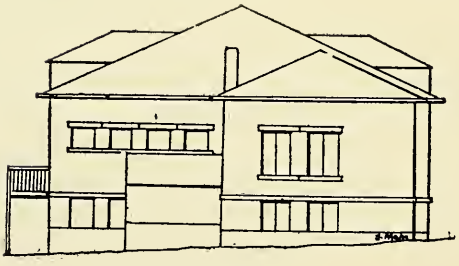
The practical application of vaccinating against hog cholera is not by any means a difficult problem, when once the serum production has been perfected in a given state. This, however, as already indicated, necessitates an expenditure of a certain amount of money for the equipment of premises, for hogs, and for qualified men. But the expense is not so great, when the annual losses from hog cholera are considered. The hypermmune hogs after the final bleeding may be used for food purposes. Vaccination to produce temporary immunity, as above outlined, is very simple, consisting in the subcutaneous injection of the **serum alone**. This may be easily done by the average intelligent farmer, and is of special use when shipping hogs from one place to another, as is frequently done with show animals. The serum-simultaneous vaccination, to produce a permanent immunity, is more complicated, since it calls for the bleeding of diseased hogs to obtain the virulent blood. This latter method will demand trained men who can be sent to the seat of different outbreaks of hog cholera.—Quoted from Dr. M. Jacob, Uni. of Tenn. Bul. 85.

AGRICULTURAL EDUCATION.

Design for a Central High School Building with Modern Equipment.

To accommodate 60 to 100 pupils, requiring 3 to 5 teachers, cost $15,000.

NORTH (FRONT) ELEVATION

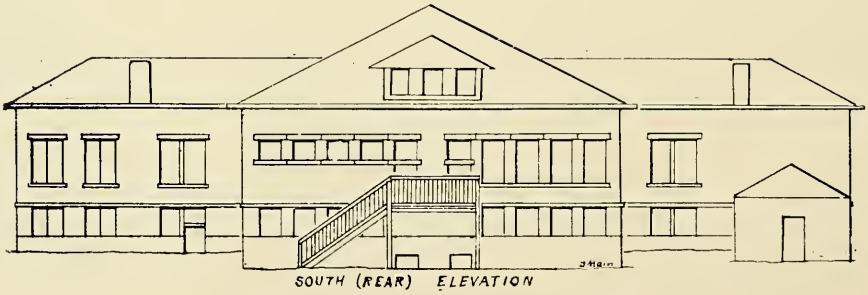


EAST ELEVATION

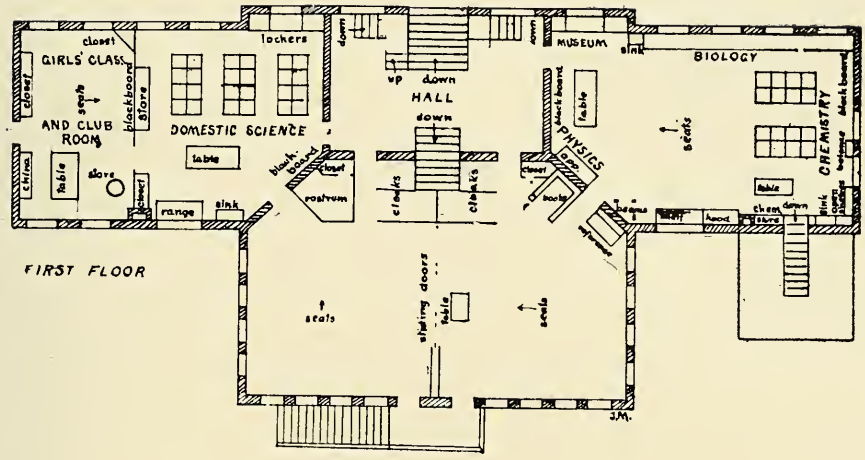
NOTE:—This building is intended to face the north on grounds sloping southward. Any other situation may require rearrangement of departments and details. Modification of these plans with a view of increasing the capacity of the building may be done either by elevating the roof of the central portion thus providing rooms on the second floor, by extending the main portion southward or by an increase of all dimensions. The plan is not elastic so as to readily admit enlargement when completed except at south side of main portion.

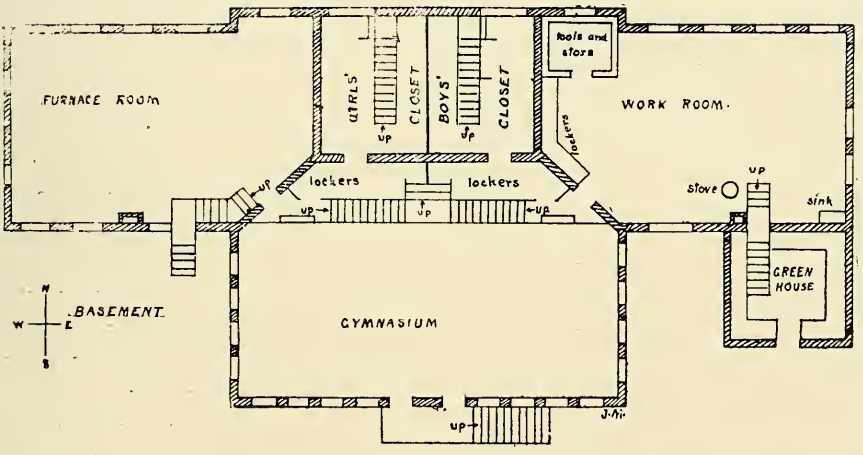
The gymnasium floor should be made somewhat lower than other portions of the basement where the slope will permit for use in drills, games, athletics and public entertainments.

Scale: 1 inch equals 25 or 30 ft.



SOUTH (REAR) ELEVATION





With a community who desire to provide courses in agriculture, domestic science, and manual training in the high school the first requisite is room. Where the building is already provided its appointments may be so adjusted as to suitably house those departments but in some cases this will not prove a very easy problem. Where the building and grounds are to be provided these purposes should enter early into the building plans and for this reason the accompanying plan is provided. The factors to be considered are too many for enumeration here. The furnishing of the laboratories is shown somewhat in detail to offset any tendency to diminish the space requirement.

JOSIAH MAIN.

EDITORIAL.

The West Tennessee Experiment Station.

The West Tennessee Experiment Station, provision for which was made by the General Assembly of 1907, was located at Jackson. The Station Farm consists of 200 acres of land, the area representing the typical soils of West Tennessee. It was purchased at a cost of $15,000 by Madison County and donated to the State, thus materially increasing the resources of the Commission whose duty it is to purchase and equip the Station before turning it over to the University, under whose management it will be conducted. The Commission from the first has had the advice of Director Morgan, and the splendid spirit of co-operation and helpfulness manifested by all interested is a guaranty of the success of the enterprise. The Station Farm was no sooner purchased than the work of improvement began. At the request of the Commission, Professor Quereau has assumed temporarily the superintendence of the Station. Under his energetic leadership the farm is the busiest place in Madison County. The tract was bought of three different owners, and fences have been removed, plowing and clearing completed, and seeding largely accomplished. The heads of departments in the Station at Knoxville will plan the work in their several lines at Jackson. Professor Moores has laid off and seeded his ranges of plats for experiments with fertilizers and field crops, Mr. Converse and Mr. Purnell, the latter a short course student of 1908, having the work in charge. Professor Keffer has made the landscape plan for the farm and has planted an orchard of eighteen acres, and collections of small fruits. Plans for the buildings are in the hands of a local architect, and his designs are very pleasing, as well as practical. All the buildings will be built of wood, one architectural design appearing throughout. The Station will have a main building, containing offices, laboratories, a creamery, an assembly hall and class rooms, as short courses are to be given there. In addition to this there will be a large barn with quarters for the work animals, dairy and beef herds, silos, graineries, feed room, and great lofts for forage, a seed house for the department of agronomy, a propagating house, potato house and barn for horticultural work, with homes for a superintendent, three foremen, and six laborers. The buildings will be erected as speedily as possible, and arrangements are already under way for the first short course, to be given during the next academic year, by which time the new Station will be completely equipped.

The First Agricultural Special in Tennessee.

History is being made every day, everywhere. Most of it escapes the books and much that has been recorded is of little worth, but when the time comes for writing the story of the agricultural development of the United States, one chapter will be devoted to the efforts of the railroads in disseminating knowledge of better methods of farming. There is neither space nor time to tell the story here, and besides your historian always prefers to wait until every body is dead in order to get what he calls perspective. Let

this be material for him, fifty years hence, when he searches the files of the U. T. Farmer for original documents. To Mr. M. V. Richards, Land and Industrial Agent of the Southern Railway System, of which the Mobile & Ohio is a part, credit is due for promoting this enterprise.

To the Mobile & Ohio railroad belongs the honor of running the first agricultural special in Tennessee and the Commissioner of Agriculture, Hon. John Thompson, was its inspiration. From his entrance into the office of Commissioner, Mr. Thompson has sought every opportunity to spread knowledge among the farmers. He has realized fully that the great need of agriculture in Tennessee is the betterment of farm life, more thorough tillage, increased crop production, protection against insects and fungi, more and better dairy farms, more and better live stock, better schools for the boys and girls of the farm, and better homes for them and their mothers. So when a moving Farmers' Institute was made possible, Mr. Thompson called in the aid of the University and of several successful farmers, and met the train, ready for business, at the first station in Tennessee north of Corinth, Miss. Professors Morgan, Mooers and Bain represented the University; Messrs. C. S. Chase and W. L. Henderson looked after the railroad's interests, which in this case seemed for the most part to be the comfort and pleasure of the speakers and the audiences.

The train consisted of a day coach, to be used as an audience room, and a private car, where meals were served the speakers.

The first day's work began at Guy's and stops were made at Ramer, Selmer, McNairy and Henderson. In the larger towns the meetings were held in the Court House or public hall and at the smaller places the day car was used. Mr. Chase explained the object of the meeting, and the purpose of the railway company in providing the train, and he was followed by other speakers. Since the time at each place was limited, the speaches were brief, and to the point. Indeed, the addresses were of a much higher quality than is usual at Farmers' Institutes, each speaker endeavoring to put his facts the more forcefully because of his limited time. Commissioner Thompson spoke of the improvement of rural schools, Prof. Morgan changed his subject to meet the peculiar needs of each locality, discussing such practical topics as the boll weevil, cattle tick, Soja bean and stock feeding. Professor Mooers was at his best and commanded the interested attention of his audiences everywhere, with his plain talks on soils and fertilizers. Professor Bain was equally successful in his treatment of clover and cotton improvement. Col. John McDowell, of Obion county, discussed alfalfa, and Mr. Craddock, of Gibson county, gave good practical talks on truck farming. The program was thus so varied as to meet the needs of all kinds of farmers. The attendance was good and the interest was remarkable. Three days were spent on the trip. The second day opened at Penson, where the school children were given special addresses by Professors Morgan and Bain. At Jackson Prof. Keffer joined the train for the day speaking on nursery stock and orchard planting. This day was divided between Penson, Jackson, Humboldt, Trenton and Dyer, the train traversing the heart of the trucking

district of West Tennessee, and the last meeting, at Dyer, being the best of the day, with an audience who filled the Assembly Hall of the High School. On the third day Rutherford, Rives and Union City were visited, Rutherford giving the largest and most enthusiastic audiences of the trip. Three meetings were held here—one in the school house, one in the day coach and the third in a vacant store—all going at once.

The first agriculture special was thus a great success, and it is to be hoped that the other railroads of the State will arrange for a similar train over their lines.

PROGRAM OF THE EAST TENNESSEE FARMERS' CONVENTION, TO BE HELD AT THE UNIVERSITY, MAY 18-19-20.

Tuesday, May 18. Morning Session, 9:30 O'Clock.

1. Call to order by the president. W. T. Roberts.
2. Invocation—Rev. R. L. Bachman.
3. Address of Welcome—Dr. Brown Ayres, president of the University of Tennessee.
4. Response—Hon. W. R. Reeves, of Johnson City, vice-president of the East Tennessee Farmers' convention.
5. President's annual Address—W. T. Roberts.

Afternoon Session, 1:30 O'Clock.

1. "Soils, Their Composition, Requirements and Possibilities"—Prof. C. A. Mooers.
2. "What Crops Shall be Grown by the Average Farmer in East Tennessee, and in What Rotation to be Most Successful?"

(a) "When Marketed Direct"—J. M. Stokely, Newport; Dr. J. J. Huggins, Oak Grove.

(b) "When Fed to Live Stock"—J. W. Cate, Cleveland; D. W. Duncan, Tasso; E. P. Darzen, Sweetwater.

3. "Resistant Red Clover"—Prof. S. M. Bain.
4. Visits to clover plots at the experiment station farm.

Evening Session, 7:30 O'Clock.

The evening session will be devoted to discussions of questions of problems suggested by the day's exercises, and a question box.

Wednesday, May 19. Morning Session, Nine O'Clock.

1. Invocation—Rev. I. P. Martin.
2. "How Can We Benefit the General Live Stock Interests of the State?"—May Overton, president State Live Stock Association, Nashville.
3. "What Steps are Necessary to Increase the Profitable Dairy Cow in Tennessee?"—Geo. Campbell Brown, Spring Hill.
4. "The Relation of Dairy Farming to Soil Building, With Special Refer-

ence to Home-Grown Feeds''—B. H. Rawl, chief dairy division, bureau of animal industry, United States department of agriculture, Washington, D. C.

Afternoon Session, 1:30 O'Clock.

1. Sheep in Tennessee:

(a) ''The Type, Management, Crops and Pastures''—Joseph F. Wing, Mechanicsburg, Ohio.

(b) ''The Parasites of Sheep''—Prof. H. A. Morgan, director experiment station, Knoxville.

2. The Profitable Raising of Hogs:

(a) ''The Type, Management and Feeds''—J. D. B. DeBow, Nashville.

(b) ''Demonstration of Use of Hog Cholera Serum''—Dr. M. Jacob, experiment station, Knoxville.

3. Feeding of Beef Cattle:

(a) ''Home-Grown Rations vs. Commercial Feeds''—Prof. F. C. Queener.

(b) ''Pastures and Feeding on Pasture''—Capt. H. R. Clay, Church Hill.

(c) ''Markets''—Dudley F. Brown, Knoxville.

Evening Session, 7:30 O'Clock.

The evening session will be devoted to discussions of questions or problems suggested by the day's exercise and a question box.

Thursday, May 20. Morning Session, Nine O'Clock.

1. Invocation—Rev. J. J. Taylor.

2. ''The Agricultural Resources of the State, and What is Being Done to Develop and Promote Them''—Hon. John Thompson, commissioner of Agriculture, Nashville.

3. ''Economics of Good Roads: Construction, Effect on Country Life, Profit to the Farmer''—W. S. Keller, Jackson.

4. Discussion.

5. Election of officers and reports of committees.

Horticulturists' Meet. Wednesday Morning, May 19.

9 a. m.—Organization.—Appointment of committees.

9:20 a. m.—''The Inspection of Nursery Stock.''—Prof. G. M. Bentley, Knoxville.

9:40 a. m.—''Truck Growing for Market''—C. W. Emory, president Knox County Berry and Truck Growers' Association.

10 a. m.—''Truck Crops for Commercial Canneries''—J. M. Stokely, Newport.

10:20 a. m.—''The Home Cannery''—S. H. Nicely, Washburn.

10:40 a. m.—''Economic Use of Low-Grade Orchard Products''—S. N. Varnell, Cleveland.

11 a. m.—''Commercial Strawberry Culture''—E. C. Coleman, Bearden.

11:20 a. m.—"Marketing Strawberries"—J. R. H. Hilton, Knoxville.

11:40 a. m.—"The Orchard Needs of Tennessee"—C. A. Keffer.

A night session may be arranged for the discussion of the above topics and any others of interest to the orchardist and truck grower.

Dairymen's Meet. Wednesday Afternoon, May 19.

1:30 p. m.—"What is the Profitable Cow for Tennessee"—B. H. Rawl, chief of dairy division, bureau of animal industry, United States department of agriculture.

2:30 p. m.—"How Can We Make the Most Out of Our Dairy?"

(a) "Shall We sell Whole Milk?"—J. W. McGee, Cleveland.

(b) "Sell Cream"—D. W. Duncan, Cleveland.

(c) "Make Butter"—D. W. Collins, Sweetwater.

3 p. m.—"Crops to be Grown and Rotation of Same for Profitable Dairy Production"—F. H. Denniss, Knoxville.

3:30 p. m.—"How Can We Best Encourage Dairying in East Tennessee?"

(a) "Dairying at State and County Fairs"—F. D. Fuller, Hermitage, Nashville.

(b) "Monthly Meeting of Dairymen in Each County"—J. A. Reagan, Sweetwater.

(c) "More Reading of Dairy Publications"—D. C. Young, Sweetwater.

4 p. m.—"Making Butter in the Farm Dairy"—F. H. Trent, Rockwood, and Mrs. W. V. DeVault, Johnson City.

FARMER—TWO

4:30 p. m.—"Butter Judging and Discussion."

A night session of the East Tennessee dairyman may be arranged at which time a more thorough line of discussion of topics of addresses delivered during the afternoon session will be taken up.

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CULTURE AND AGRICULTURE.

"The high standard of moral and intellectual discipline for which our schools and universities have been distinguished has not been lowered, nor has the pursuit of literary and historical studies been checked by the inclusion in the university curriculum of those scientific studies, especially of those branches of applied science for which such ample provision has now been made. I rejoice to think that the opportunities open to the young men of our great industrial communities of acquiring a knowledge of subjects of commercial utility in an atmosphere of academic culture are being so greatly increased, and I find it difficult to express my appreciation of the manner in which the great responsibilities which rest with the authorities and teachers of a university such as this have been discharged. It is a source of pleasure to me to know that you have provided also for the study of the theory and practice of agriculture, for I am convinced that the best possible results can not be derived from the industry and natural ability of our farmers unless they are properly instructed in the scientific aspects of their work."—Remarks of King Edward at the University of Leeds, July, 1908.

The U. T. Farmer

Vol. III. JUNE, 1909 No. 9

THE CONVENTION OF 1909.

The Agricultural Students of the University of Tennessee always welcome the coming of the East Tennessee Farmers' Convention. During its sessions classes are abandoned for both professors and students realize the high educational value of the convention. The senior students have seen four conventions, and all pronounce that of 1909 the most successful in their time. It was a matter of general remark and congratulation among the delegates that in variety, in the quality of the addresses, in attendance, and in sustained interest, this was the most successful convention that has been held in recent years.

It is no reflection on previous conventions to claim for this a high standard of delegates. Evidently the vice-presidents and those who selected the delegates did their work carefully and well, and the result was a representative body of farmers who would be a credit to any commonwealth.

The attendance at all the sessions was above the average, and the interest was marked. Only three speakers were "foreigners"—came from outside our state—and of these Mr. Keller is a resident of Madison county, though at present in the Government service, while Messrs. Wing and Rauls have proven themselves worthy the distinction of Tennessee citizenship by their previous popularity with Tennessee audiences.

Mr. J. M. Stokeley, of Newport, was interesting, both before the general convention and the horticultural section. To the fruit and truck growers he gave practical advice on canners' crops and canning. The convention was fortunate in having Hon. May Overton, the president of the State Live Stock Association, Mr. Geo. Campbell Brown, president of the State Dairymen's Association, and Dr. J. D. B. DeBow, the Berkshire breeder, among the speakers. These gentlemen reside in Middle Tennessee and each is a successful farmer in his special line. Nothing can be more fortunate for a meeting of practical men, than to listen to the experiences of eminently successful specialists familiar with local conditions.

This fact was further illustrated and if possible emphasized, in the addresses of Professors Moorers and Jacob, of the Experiment Station staff Professor Mooers' remarks on soils and their requirements are quoted in part, in another place in this issue. Dr. Jacob gave a demonstration of

the inoculation of pigs to prevent cholera, which proved of great interest to the farmers.

Hon. John Thompson, Commissioner of Agriculture, has won the hearts of the East Tennessee farmers by his way of doing things. While the Convention has been a great success in years past, Commissioner Thompson has appreciated its possibilities far more than any of his predecessors, and has made its sessions a great practical school. It is through his efforts that transportation has been secured for the delegates, and it is to his hearty co-operation the Convention is a heavy debtor.

The special session devoted to horticulture was well attended, and quite the most interesting horticultural meeting ever held in the State.

Professor Bentley gave a demonstration of the more common diseases of fruit trees in the nursery, and told what the law requires in the way of freedom from insect and fungus infestation. Mr. C. M. Emery gave a very practical and helpful discussion of market gardeners' crops, and the questions that followed evinced the interest of his hearers. Canning and canners' crops were discussed in detail. It was evident that home canning is a permanent part of East Tennessee truck farming.

In the late afternoon over a hundred delegates visited the University Fruit Farm, where Professor Keffer gave a demonstration of spraying for the prevention of peach rot with self-boiled lime-sulphur solution. Great interest was here manifested in orchard management.

The special session devoted to dairying was equally successful. There was a demonstration of butter judging and general discussion of dairy topics, led by such experts as Chief Raul of the Dairy Division, U. S. Dep't of Agriculture, Professor Denniss and Barnes, of the University, and prominent practical East Tennessee dairymen.

The interest in these sectional meetings showed that they supply a need, and warrant the hope that they will be continued and the number of sections increased.

While old men among the delegates continued to constitute a majority of the Convention, it was gratifying to see an increased number of young farmers present, and their apparent interest was one of the most pleasing features of the Convention. All in all it was a great convention, reflecting credit upon the officials who planned it, and upon the delegates whose presence and attention proved its worth.

REPORT OF COMMITTEE ON MEMORIAL.

Memorial to Capt. E. G. McClure.

Capt. E. G. McClure was born in Washington County, near Jonesboro, Tennessee, where he grew to manhood and spent most of his life.

He entered the service of the Confederate Army while quite young and obtained the rank of captain.

While he was considered one of the best farmers of his section, the greater part of his life was spent in the educational interests of his county. He held a professorship in Washington College for several years and was at one time the president. He was a ruling elder in the Presbyterian Church, and also a trustee of Washington and Tusculum College at the time of his death. As a citizen we had none better; he was held in the highest regard for his conscientious adherence to the right and for his mental ability.

He was a churchman, and a high class farmer and educator, and each and all of these interests lost a valuable promoter in his death. He was about 65 years of age at his death. Of him it can be said that those who knew him best loved him most.

Memorial to James Walter Young.

James Walter Young was born July 31, 1868, at Eagle Bend, near Clinton, Tenn. He died September 20, 1908, at the place of his birth. The son of one of the State's best known jurists, Judge D. K. Young, he enjoyed all of the advantages of favored youth. With his vocation as lawyer, the father combined the business of farming. In his beautiful home on his fertile farm of large acreage on the Clinch River, he surrounded his children with the best associations and influences.

In time Mr. Young became a student at the University of Tennessee. There he impressed his personality upon the student body and the teaching staff as one of gifted mind. His talents as a writer were made manifest in the pages of the Monthly Literary Magazine, of which he was one of the editors. He became a graduate of the Law Department. Later, to fit himself for a larger career in law, he took a course at Harvard University. His literary tastes and accomplishments led him to become connected with the press, and for a time he did work on the New York Sun.

Returning to his Tennessee home, he entered upon the practice of law, associated with his venerable father. Unable to throw off the fascination for writing, he continued to write for magazines and newspapers. He wielded a graceful pen, was clear and cogent in the expression of his ideas, and had a critical faculty which was incisive and illuminating.

Preferring the peaceful and delightful pursuits of agriculture to the practice of law, Mr. Young soon abandoned law and became actively engaged in farming near his boyhood's home. With hearty interest and intelligent enthusiasm he entered upon this work. He chose dairying as the most congenial and profitable department of farm economy. In building up his herd and improving his farm he sought every available

avenue of information for betterment. He took the best live stock and dairy papers, he visited farmers' institutes and participated eagerly. He conferred with men whose experience would give him helpful hints. Not infrequently he was to be seen on the University experiment farm. His interest in the welfare and progress of the East Tennessee Farmers' Convention and Institute was deep and abiding. He never failed to attend its meetings, nor to derive large benefit from them.

In his untimely death, this organization has lost a zealous member. In grateful recognition of his sympathy and cooperation, and in memory of his life and services, the East Tennessee Farmers' Convention and Institute adopts this memorial as an expression of the worth of Mr. Young and of sorrow over his death. In sadly considering the great loss sustained in his death we are made even more sorrowful by the glimpses given us of the possibilities of latent powers evinced.

H. B. CLAY,
GEO. F. MELLEN,
W. GETTYS,
W. R. REEVES,
Committee.

THE CONVENTION'S INTEREST IN AN EAST TENNESSEE FAIR.

The annual sessions of the East Tennessee Farmers' Convention have been of great service to the agricultural interests of this section, but with united effort the convention may even more permanently aid in the development of agricultural and educational enterprises of lasting benefit to the rural life of the state. A well organized and successfully managed agricultural fair is the only school of all the people. The function of such a fair is met by no other educational institution. It is not surprising then that the East Tennessee Farmer's Convention should consider the value of a fair for this section of the State and means of promoting it. In the business meetings of the vice-presidents which were held each morning prior to the regular program of the convention much time was spent in discussing the fair problem. A committee to consider means of promoting such an enterprise was appointed and the following resolution was introduced and passed by the convention.

THE EAST TENNESSEE FAIR

Resolutions Adopted by the East Tennessee Farmers' Convention and Institute, Knoxville, May 20th, 1909.

Realizing the many advantages, in all branches of agriculture and live stock industry, that would be derived from an East Tennessee fair, your Committee recommends the following report:

1. That we heartily endorse an East Tennessee fair, to be located in the county offering the greatest inducements.

2. That the county vice-presidents of the East Tennessee Farmers' Convention may take in the fair be used toward the buying of real estate such representation as may hereafter be decided upon.

3. That whatever amount of stock the East Tennessee Farmers' Convention may take in teh fair be used toward the buying of real estate or the buying of shares which warrant real estate security.

H. M. WILSON
JNO. A. JONES
ALBERT R. RANKIN
W. V. DE VAULT
W. C. SHAW
Committee.

From the above resolution it is clear that the East Tennessee Farmers' Convention stands ready to co-operate through its exeeutive committee with that community which offers the best opportunity for the successful eonduet of a division fair.

The convention instructs its Exeeutive Committee by resolution to take up the matter of an East Tennessee Division Fair with that place offering the greatest inducements and authorizes the Executive Committee to subscribe under the above resolutions an amount of money for the promotion of said fair that may be necessary, provided, said amount shall not exceed $2,500.00.

PERSONALS.

Many farmers took the automobile ride and enjoyed the experience of searing the other fellow's horse.

The Convention was good to President Roberts and Secretary Morgan, presenting them with elegant tea sets.

Austin W. Shofner represented the College of Agriculture in the closing exercises of the University in a most creditable manner.

F. A. B. Roark, a short course student of '07, is vice-president from James County, and takes an active part in all convention affairs.

Col. John Thompson, Tennessee's distinguished Commissioner of Agriculture, was prominent in all the activities of this year's convention.

Dr. Jacob made a most interesting and successful demonstration of immunizing hogs against cholera on the morning of the third day's session.

R. L. Jones, State Superintendent of Education, dropped in on the Convention and passed a few remarks to the farmers. Mr. Jones was raised on a farm in White County, and is very much interested in matters related to the betterment of rural conditions.

Prominent among the visiting speakers at the Convention were Joe. E. Wing, Mechanicsburg, Ohio; Hon. May Overton, President of the State Live Stock Association, Nashville, Tenn.; Judge J. D. B. DeBow, of Ravenwood Berkshire Farm, Nashville; Geo. Campbell Brown, President of State Dairymen's Association, Spring Hill, Tenn.; B. H. Raul, Chief of the Dairy Division, U. S. Dep't of Agriculture, Washington, D. C., and W. S. Keller, the good roads expert of the U. S. Dep't of Agriculture. The addresses of these gentlemen were much appreciated.

THE U. T. FARMER BECOMES THE CONVENTION'S OFFICIAL ORGAN.

In the past it has been difficult during the interval between meetings without a vast amount of correspondence to keep the members of the convention posted as to the services each county vice president rendered. There has been no medium of communication among the delegates. The work of individual county institutes has been unknown in other counties and the encouragement that comes from a knowledge of what co-workers can do has in a very great measure been lost to the farmers represented in the convention.

Feeling the need of a medium of communication, the vice-presidents adopted a resolution authorizing the secretary to use the U. T. Farmer as the official organ of the Convention and to publish through this periodical all matters of business and interest to its members. The secretary was further instructed to give the management of the U. T. Farmer the names and addresses of the officers of the Convention. The president, vice president, county vice president and members of the executive committee—in order that copies of the Farmer might be sent regularly to these officials.

In the future these official announcements relating to the East Tennessee Farmers' Convention will be made through the U. T. Farmer and the management will be glad to devote each month several pages to convention interests. The vice presidents are especially invited to send to

the Farmer items of interest relating to farmers' institute work, convention work, or to the activities of the farm.

Address all matters, U. T. Farmer, College of Agriculture, Knoxville, Tenn.

THE FARMERS AT THE EXPERIMENT STATION.

The members of the Convention always enjoy their visits to the various departments of the experiment station. This year the field crops and plots were exceptionally fine. The double crop systems now in vogue indicate what may be done by more intensive methods in hay and grain production when live stock is used.

The large fields of mixtures of hairy vetch, crimson clover and Smona oats were especially attractive pictures. The selections of immune clover, barley, oats, wheat and other crops, promise better yields in the future. That alfalfa may be successfully grown in Tennessee was amply demonstrated. The station's method of clean culture preparation the application of green or farm yard manure and liberal applications of lime and phosphorus has proven most successful. The discing of alfalfa has proven very beneficial as was indicated in the increased stand on a field that has for more than two seasons been disced twice after each cutting. The farmers asked many questions relative to the use of ground limestone rock. More than 100 tons of this material has been used on the station during the last two years with remarkable results. After Prof. Mooers' address on the value of rock lime a demonstration of its application was given with a Superior Distributor, upon land in preparation for alfalfa. As much as three tons per acre was applied in the demonstration. There is a great opportunity for counties building turnpikes to supply farmers with a cheap lime in the form of crushed rock. In fact the money realized on bonds could be made go much further if counties owning crushers would sell farmers lime rock screenings at $1.00 per ton.

FUTURE PROGRAMMES OF THE EAST TENNESSEE FARMERS' CONVENTION.

At this year's convention, for the first time, special meetings were devoted to Dairying and Horticulture. The interest was so pronounced that it seems advisable to devote more time to special interests. The "greatest good to the greatest number" is a good maxim to follow in arranging programmes. Here are a few suggestions for the officials of the convention to think about before formulating the programme for the next convention.

1. Let the business meetings of the vice-presidents be held on the

day previous to the opening of the convention, thus avoiding delay in opening the regular daily sessions.

2. Hold general sessions of the convention in the morning and evening (night) of each day, leaving the afternoons free for departmental meetings.

3. Establish departments of Field Crops, Live Stock, Dairying, Horticulture, Poultry and Women's Work. Each department to hold not more than two afternoon sessions, with special programmes devoted to the interests concerned. The Department sessions may be held at the University Farm, the University Fruit Farm, or on the Campus, and demonstrations may thus be arranged.

4. Only such subjects and business shall be discussed at the general sessions of the convention as are of interest to all farmers: purely departmental topics to be reserved for the special programmes. At the same time every agricultural interest of any prominence or promise in East Tennessee may properly find place in the general sessions.

5. The general sessions should be inspirational and the special departments should be largely instructive and devoted to details.

OFFICERS FOR 1910 CONVENTION.

President, W. R. Reeves, Jonesboro, Washington County.

Vice-president, J. W. Cate, Cleveland, Bradley County.

Secretary and Treasurer, H. A. Morgan, Knoxville, Knox County.

County Vice-presidents.

Name	Post Office	County
H. G. Dail	Clinton	Anderson
W. S. Lloyd	Pikeville	Bledsoe
A. C. Atchley	Maryville	Blount
J. W. McGhee	Cleveland	Bradley
L. S. Richardson	LaFollette	Campbell
J. A. Whitehead	Hampton	Carter
A. B. Lanham	Tazewell	Claiborne
J. C. Easterly	Parrottsville	Cocke
A. F. Bryan	Rutledge	Grainger
N. P. Earnest	Chucky	Greene
S. S. Smith	Whitesburg	Hamblen
W. S. Beck	Chattanooga	Hamilton
John M. Southern	Sneedville	Hancock
A. W. Maine	Rogersville	Hawkins
F. A. B. Roark	Birchwood	James

W .B. Stokely	Dandridge	Jefferson
N. R. Wills	Mountain City	Johnson
John A. Jones	Concord	Knox
James R. Willson	Loudon	Loudon
H. M. Wilson	Niota	McMinn
A. R. Rankin	Jasper	Marion
E. M. Graves	Decatur	Meigs
James May	Sweetwater	Monroe
R. H. Madan	Lansing	Morgan
F. D. Copeland	Fetzerton	Polk
H. L. Reynolds	Dayton	Rhea
W. C. Shaw	Harriman	Roane
Jasper Hewitt	Robbins	Scott
W. T. Alley	Dunlap	Sequatchie
T. D. W. McMahon	Sevierville	Sevier
Joe C. Gray	Bristol	Sullivan
E. L. Anderson	Johnson	Unicoi
A. F. Smith	Paulett	Union
W. V. DeVault	Johnson City	Washington

Executive Committee.

John A. Jones	Concord	Knox
W. G. Lenoir	Philadelphia	Loudon
G. H. Strong	McMillan	Knox
W. T. Roberts	Riceville	McMinn
H. L. Reynolds	Dayton	Rhea
H. M. Willson	Niota	McMinn
J. K. P. Wallace	Clinton	Anderson
H. B. Clay	Church Hill	Hawkins
D. W. Duncan	Tasso	Bradley

Finance Committee.

H. M. Wilson	Niota	McMinn
D. W. Duncan	Tasso	Bradley
H. A. Morgan	Knoxville	Knox

Committee on Resolutions.

James Rector	Cumberland Gap	Claiborne
F. A. B. Roark	Birchwood	James
J. A. Farmer	White Pine	Jefferson
R. P. Donnelly	Mountain City	Johnson
G. W. Fetzer	Fetzerton	Polk
W. H. George	Louisville	Blount

THE IDEAL FARMERS' CONVENTION.

The success of the Convention, while gratifying, does not imply that it has reached perfection. On the contrary it suggests the possibility of far greater results as the outcome of more perfect organization and consequent interest among the rank and file of the farmers at home.

In the very nature of the case, only a few of the many farmers in East Tennessee can attend the Convention in Knoxville: but there is no good reason why every county should not hold an institute of its own, with permanent organization and frequent meetings. The Ideal Farmers' Convention will be composed of delegates named by such county organizations, and the delegates will report to them in as full detail as may be, what they heard at Knoxville. Every Vice-President of the East Tennessee Farmers' Convention should thoroughly organize his home county, using the delegates to the convention just closed as a nucleus. Let each Vice-President send out a call, and make it the duty of each delegate who came to Knoxville to secure the attendance of the farmers of his neighborhood. Hold a meeting at the County Court House at a convenient time. Arrange a good programme and assign the topics to successful farmers. If possible have monthly, or at least quarterly meetings. Call them what you will—Clubs, Institutes, Farmers' Conventions—but get in all the agriculture that is possible, and keep out all politics! Let the members of the county institutes have a voice in naming the delegates to the annual convention in Knoxville.

Interest the women, and the boys and girls. One of the pleasing features of the last convention was the presence of an entire school, with the teacher, from Blount County. The boys and girls visited the University Farm and the Fruit Farm and listened attentively to several of the addresses. They were benefited, and so were their home people.

The ladies should take an active part in the County Institute. The writer recalls a farmers' meeting in Coffee County at which many of the farmers wives and daughters assisted, to the great advantage of all concerned. Let there be women delegates to the Knoxville Convention. There are home problems, as well as field problems, which can be better solved by advice and interchange of ideas. The Ideal Farmers' Convention will number among its most important sections, that devoted to woman's work.

Interest the boys and girls. It has often been said there are not enough young men among the delegates: why not organize in each county institute a Junior Order of Tennessee Farmers, and have corn growing contests, and other friendly rivalries of interest to future farmers?

The Farmers' Convention is above all else educational, and the ideal convention will see in the work of enlisting and increasing the interest of young people in agriculture a purpose worthy its greatest efforts.

GRAINS AND LEGUMES FOR FORAGE.

To the great majority of visitors to the University Farm the most impressive lesson learned was the use of oats and Canada field peas; oats, crimson clover and hairy vetch; and crimson clover and rye as hay or forage crops. All three of these mixtures were seen under field conditions. The average farmer has much more faith in results displayed in fields several acres in extent, than in plots of small size, and here were splendid crops covering areas such as he might use at home.

In every case these crops were sown after a regular crop had been harvested. The most attractive combination—Smona oats, crimson clover and hairy vetch, was sown last October, on land from which a heavy crop of ensilage, sorghum and clay peas had been harvested. Neither the ensilage crop nor the forage crops received a pound of fertilizer (the land was strong) and it was easy to see that the station would cut two tons per acre of first class hay from the field. This has since been done, and Superintendent Campbell thinks the yield would have been much heavier had the crop been cut ten days earlier.

During the first half of June, soy beans will be drilled in this field. The land will not be idle a week! This is the kind of farming Tennessee needs.

The crops of Canada peas and oats is on poorer land and Professor Morgan is doing what many farmers might consider an extravagant thing, for instead of cutting this heavy crop he is plowing it under! That stiff clay loam needs humus, and this is the way to make it. Then it will be given a heavy dressing of lime-rock dust and then, when the Convention makes its next inspection, just be prepared to see a crop on that field such as it never produced before!

These forage crops of winter cereals and legumes, sown in September or October, after the season's crop is harvested and cut in May, in time for late corn, cow peas, soy beans or ensilage, not only provide hay of feeding quality, higher than timothy, but they protect the soil from the impact of heavy winter rains, they prevent erosion, and thus from every point of view, are a distinct gain to the farmer.

The old one-crop-a-year method of farming is doomed in Tennessee. We are growing two crops now, and some of us are doing even better than that.

Sow a field of oats, crimson clover and hairy vetch next September.

ESSENTIAL FACTS WITH REGARD TO LIME FOR TENNESSEE SOILS.

Lime contains one of the necessary elements of plant food and may be needed on that account. Usually, however, its favorable action can be

attributed to other effects, in particular to the correction of an acid or sour condition of the soil and to the liberation of other elements of plant food; also to the improved physical condition of the soil.

The soils of Tennessee are poor in lime, according to the numerous chemical analyses made at the Station. One to two-tenths of a pound of lime in 100 pounds of soil is a usual amount, while one-half a pound would be required for an ample supply. Field experiments not only at the Station farm, but elsewhare, in various parts of the State, corroborate the conclusions of the chemical work and prove lime to be of much practical importance. In some instances practically no clover (alsike) could be obtained, even with the aid of 12 tons of manure to the acre, unless lime were added. With the application of one ton of quicklime to the acre, splendid crops resulted. Both fertilizers and farmyard manure were greatly strengthened in this way. Wheat, corn and cowpeas were also found to respond profitably to lime. A series of experiments on the farm of W. P. Ford, South Knoxville, gave the following results, which are characteristic of those obtained elsewhere in a rotation of cowpeas followed by wheat:

Plot	Fertilizer per acre (Applied to cowpeas only)	Disposition of cowpea crop	Yield of grain per acre (average of two years)	
			Without lime	With lime
6	None	Removed as hay	13.2	20.5
7	200 lbs. acid phosphate 50 lbs. muriate of potash	Removed as hay	21.4	25.9
1	The same as plot No. 7, but no cowpeas		11.0	16.4
10	None	Turned under	20.3	22.3
4	The same as No. 7	Turned under	22.2	25.9

Attention should be called to the fact that in other experiments the turning under of cowpeas was much more profitable than in the above, where the mechanical condition of the soil was plainly helped to a marked extent by the mere growing of the cowpea crop. In trials on other farms, increases of 6 to 8 bushels of corn to the acre were usual as a result of liming. In the majority of the experiments burnt lime was used at the rate of 2000 pounds per acre, but ground limestone in about te condition of coarsely ground corn meal has been tested and is highly recommended, but should be applied in double the quantity of the burnt lime. Lime spreaders are valuable in applying the ground rock, and both the Superior, manufactured by the American Seeding-Machine Co., Springfield, O., and the Stevens, manufactured by the Belcher & Taylor Agricultural Tool Co., Chicopee Falls, Mass., have given excellent results.

Lime does not do away with the necessity of acid phosphate as a fertilizer, but adds to its value.

Lime is destructive to vegetable matter, and the old adage—

"Lime and marl without manure
Make both farm and farmer poor"

should be heeded. A good crop rotation in this connection is as follows:

Cowpeas
Wheat
Clover and grass (2 years)
Corn

Apply the ground limestone at the rate of two tons per acre, once, at the outset of this five-year rotation.

WHAT IS THE MATTER WITH THE FARMER?

Wisconsin has long occupied a leading place in educational development, and today stands at the head in the number and quality of her agricultural high schools. This being true, the following answer to the above question, quoted from Hoard's Dairyman, is of especial interest. In Tennessee and throughout the country, conditions warrant Gov. Hoard's query, and everywhere his comment is true.

"The kind of education the farmer receives; the state has been grievously derelict in providing the farmer with an education that would equip him for his life work and at the same time develop his intellect.

The country school is the poorest, the most incompetent to its purpose of any school in the land. It does less for those it has in charge. The poorest school in village or city is a king beside it in what it confers upon its children. And so, 'as the twig is bent the tree is inclined'—as the child is educated the grown man takes shape.

At the country school 95 per cent of the American farmers derive all the schooling they will ever receive. Its training is wretched in reading, writing and arithmetic. It teaches the farm boy or girl nothing that will help him or her to comprehend farm problems in after life. Its teachers do nothing to create in farm children a taste for the literature of the farm; consequently the farmer, in a great percentage of cases, has no desire for such literature. He is like everyone else, very largely what his early education has made him.

As a rule, farmers do not appreciate this fearful weakness of the country school. They look upon it wholly from what it costs, not what it might do for their children.

The native intellect of the farmer is of the very best. Give the farm boy or girl a fair chance for study and the gaining of knowledge, and we need not fear the result. But, way back in the country district school starts the difficulty, the cause for all the hindrance, all the waste of natural resources, all the backwardness of mind, all this refusal in after life to read and make progress. Had the other classes in American society been given the same school in their youth, where would they be today? The farmers of the United States must awaken to a better understanding of the dwarfing effect the country district school has upon the minds of their children. It is their duty, for the sake of the good name and standing of the name and profession of farming, to make that school as good as can be and an inspiration for better things.

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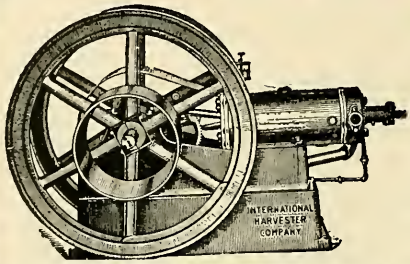

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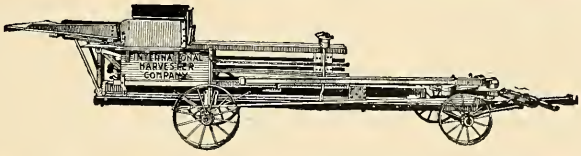

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Vol. III No. 2

NOVEMBER, 1908

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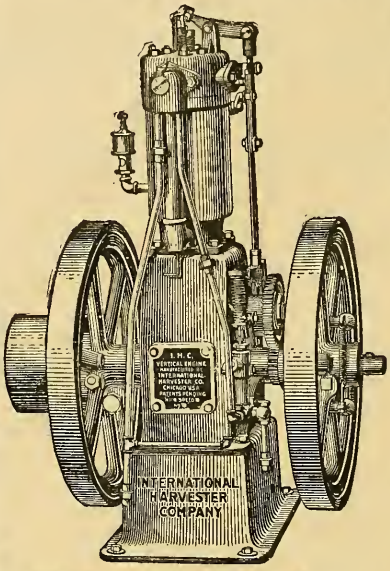

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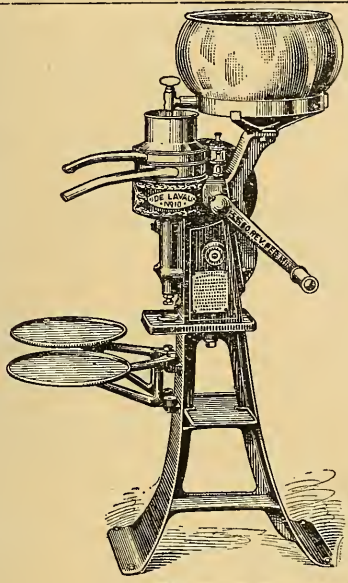

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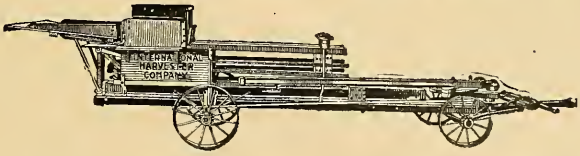

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Vol. III No. 3

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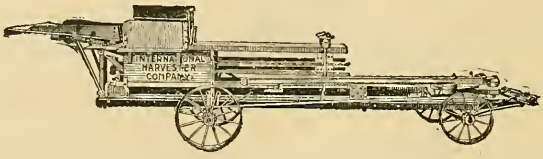

The I. H. C. Pull Power Baling Press is built to bale the greatest amount of materials with the least expenditure of energy. It is easy on both man and horse, and will bale more hay with less power than any other press of its size. This is due to the unique construction of the plunger and power. They furnish speed and great compression power just when they are needed without adding extra draft.

To be brief, the **I. H. C. Pull Power Baling Press** fills the requirements of farmers who want a press that has durability, great capacity and ease of operation to recommend it.

The I. H. C. Pull Power Baling Press is built in one and two-horse power. The one-horse press has a 14″x18″ bale chamber. The two-horse press has three sizes of bale chamber—14″x18″, 16″x18″, and 17″x22″.

Call on local agent for information concerning this press or
Write for Illustrated Catalog

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You cannot afford to do without it.
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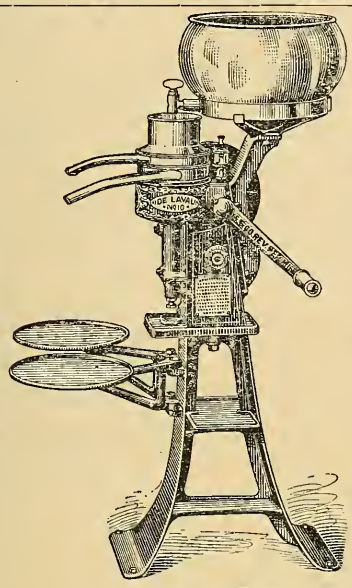
(Its use permitted in Official dipping for Scab on Sheep.)
Can give you references from large breeders in your State.
Let us send you circular and prices f. o. b. your station.

W. E. MINOR & CO. Wade Bldg. CLEVELAND, OHIO



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WYANDOTTE
CLEANER AND CLEANSER

Does **no** damage even to the hands or the finest fabrics. It dissolves and washes away **all** dirt and foreign matter so easily and thoroughly that the time taken is greatly lessend.

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Get a Sack From Your Dealer

Use it all and if you do not find the above claims are true THE COST IS NOTHING.

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We furnish only the best apparatus and refer to College of Agriculture—University of Tennessee, as to character of our goods and our responsibility. If you need anything along the line of Laboratory Supplies, write us.

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When you are ready to equip your Science Laboratory, correspond with us.

CENTRAL SCIENTIFIC COMPANY

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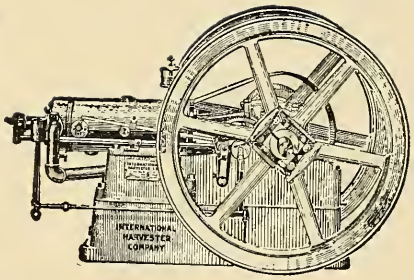
WHAT SIZE POWER DO YOU NEED?



You know how many hired men you have, you know how big your farm is, you know how many machines you have requiring power.

Now look at this line:

I. H. C. vertical engines—made in 2, 3 and 25-horse power.

Horizontal (portable and stationary) in 4, 6, 8, 10, 12, 15 and 20-horse power.

Gasoline tractors—in 10, 12, 15 and 20-horse power.

Famous air-cooled engines—in 1 and 2-horse power.

Also Famous sawing, spraying and pumping outfits. A complete line of Famous self-contained engines mounted on skids or ready for mounting by the purchaser.

You will surely find in this line an engine which will exactly suit your needs. For operating the small machines—grinder, fanning mill, churn, separator, pump, saw, grindstone, washing machine, fodder cutter, etc.,—one of the small I. H. C. vertical or horizontal engines will fill the bill admirably. Perhaps the work is to be done at different points on the farm, in which case we suggest that you purchase a Famous engine on skids or a regular portable engine.

For operating a thresher, sheller, husker and shredder, you will find a portable engine best. If you want to haul heavy loads and at the same time supply power from the crank shaft, get a gasoline tractor.

It isn't a question of whether you need a gasoline engine, it's simply whether you have one, because experience has proved that every farmer who does not have an engine should have one by all means. If you haven't a gasoline engine, pick out the one which will answer your purpose, then call on our local agent and investigate. Look into its economy, reliability, durability and simplicity—those are the four cardinal points. If you prefer, write the home office for complete information.

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Candy he sends to his girl

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In the Dairy

In the Orchard

With the Bees

STUDENTS AT WORK

Vol. III No. 4

JANUARY, 1909

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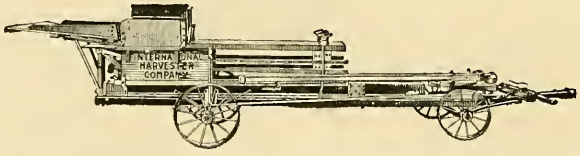
A Successful Hay Press



Successful—Because it makes neat, compact, and uniform bales; is operated with less amount of power, and has greater capacity than any other press of its size.

The power is a full circle with two strokes of the plunger to one revolution of the sweep, and is made on the compound lever principle, giving speed and great power where they are needed.

The toggle joint construction of the plunger gives greater compression power with less energy than any other method known to modern science.

The I. H. C. Press is made in one and two-horse power. The one-horse press has a 14″x18″ bale chamber. The two-horse press is built with three sizes of bale chamber—14″x18″, 16″x18″, and 17″x22″.

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Write for complete information

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Can give you references from large breeders in your State.
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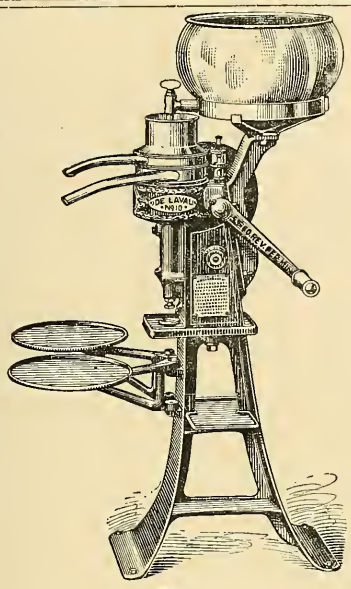

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Fortunately dairymen and butter and cheese makers do not have to depend on sunshine for purity because they can always have sweet, fresh, wholesome separators, cans and milk utensils by using,

WYANDOTTE DAIRYMAN'S
CLEANER AND CLEANSER

The first cost is small and it saves all along the line.

None Genuine
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On Every
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Order a Barrel from Your Supply House.

It will cost you nothing if not satisfactory

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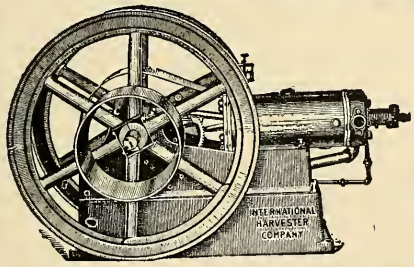

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That's what thousands of farmers call the I. H. C. engine—a reliable helper —the best hired man

Because it is always a convenient source of economical power—works right day or night, summer or winter, for anybody—you or your boy.

They are built on right lines, and made so simple and easy to understand that nothing but neglect or misuse can put them out of action.

Their many sizes and styles adapt them to all farm uses—operating the sheller, grinder, thresher, shredder, fanning mill, churn, separator, pump, saw, grindstone, fodder cutter, washing machine, etc.

I. H. C. vertical engines made in 2, 3 and 25-horse power.

Horizontal (portable and stationary), in 4, 6, 8, 10, 12, 15 and 20-horse power.

Gasoline traction in 10, 12, 15 and 20-horse power.

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WHIPPOORWILL COW PEAS—3 ROWS ITO SAN SOY BEANS—3 ROWS

As they appeared in the field 43 days after the planting of June 15, 1908.

Vol. III No. 5

FEBRUARY, 1909

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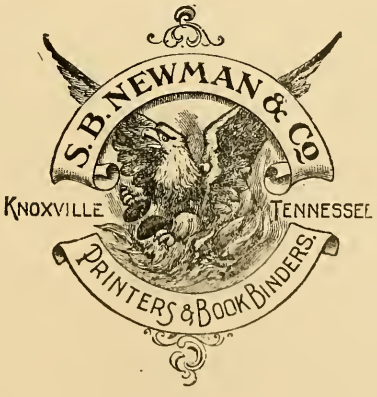
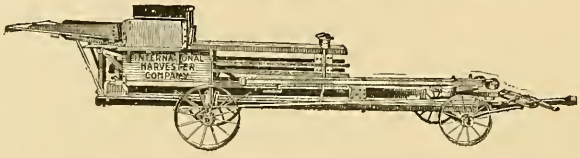


I. H. C. Pull Power Hay Press



The I. H. C. pull power hay press has distinctive features of merit which make it a most desirable press.

It pulls easier on the horses than any other press of the same size. This is due to the compound lever power and toggle joint plunger.

It can be set up to and within barns, and at either end or any position between the ends of stacks, making easy work for the pitchers.

The bale chamber is low, enabling the tier to tie bales so that square-cornered and neat bales are formed.

The press is made in one and two-horse sizes.

Call on local agent and inspect the I. H. C. press. Write for catalog and full particulars.

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De Laval Cream Separators

When you buy a DE LAVAL Cream Separator you buy mechanical perfection. You get the product of the greatest painstaking mechanical skill and the finest of manufacturing tools. Of special note in this connection is the fact that the bearings and revolving parts of DE LAVAL machines are fitted to less than the one thousandth part of an inch, or, in other words, to about one-fifth the breadth of a human hair. Such a degree of exactness is invisible to the naked eye and can only be determined by the finest of gauges. It is nevertheless the set standard to which all DE LAVAL spindles and bearings must be fitted. Any parts which do not come within this degree of accuracy are thrown aside by the DE LAVAL factory inspectors and much material and many hours of work are sacrificed in this way annually. It is this very sacrifice, however, that makes the DE LAVAL cream separator so extremely durable and capable of lasting from fifteen to twenty-five years under the hardest farm usage and of always doing easily the very best work under any and all conditions. It is the reason for their remarkable ease of operation and absolutely perfect working in every part. No other separator or farm implement made today has anywhere near the care, time, or expense devoted to its manufacture that the DE LAVAL has. When you buy a DE LAVAL you get the best that money can possibly buy and skill can make in a cream separator way. Moreover, you pay less for it than for any would-be competing separator of similar actual capacity. The DE LAVAL catalogue explains and illustrates these all important points. It is to be had for the asking. Write today.

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None Genuine Except With Trade Mark

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Use it for washing and cleaning milk cans, churns, separators and utensils and for general cleaning. Try it in the household.

Find for yourself how easily everything may be made sweet and pure without greasy soap or soap powder and without caustic, sal soda or harmful chemicals. Remember, a trial costs nothing unless satisfactory.

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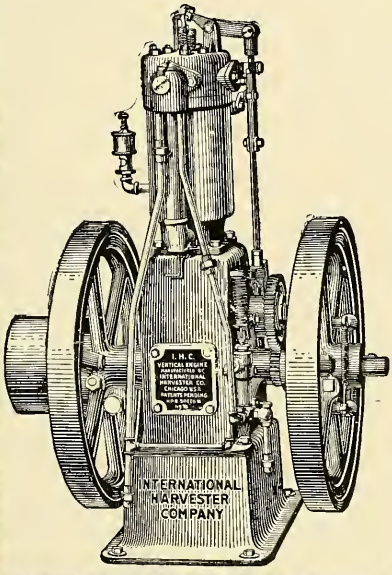
WORK LESS
Accomplish More



THAT is the secret of success nowadays. You have had experience with hired men—you know that many times in order to get anything done right you have to do it yourself. There are too many odd jobs around the farm for you to do them all. There is the sheller, grinder, churn, separate pump, saw, grindstone, fanning mill, washing machine, and many other machines to operate. You can't do it all.

You can, however, if you get an I. H. C. gasoline engine to assist you.

One of these engines will furnish cheap, absolutely reliable power for these and a hundred other jobs. The engine works practically without attention, so that you will be able to accomplish twice as much as formerly and you won't have to work as hard.

That means you are going to make more money out of farming and that is what you are farming for.

I. H. C. vertical engines made in 2, 3 and 25-horse power.

Horizontal (portable and stationary) in 4, 6, 8, 10, 12, 15 and 20-horse power.

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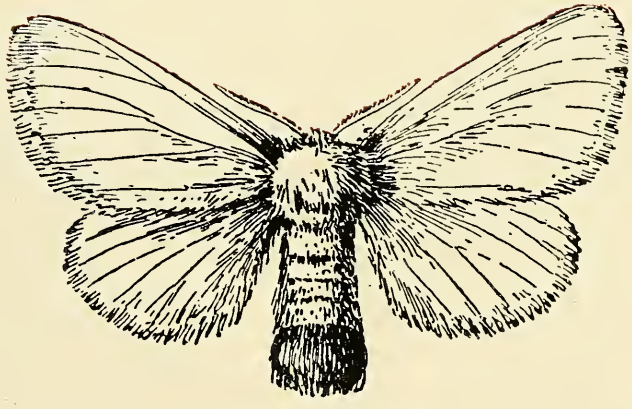

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(ENLARGED FOUR TIMES.)

Vol. III No. 6

MARCH, 1909

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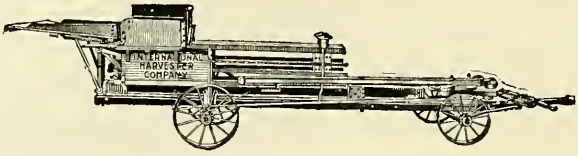

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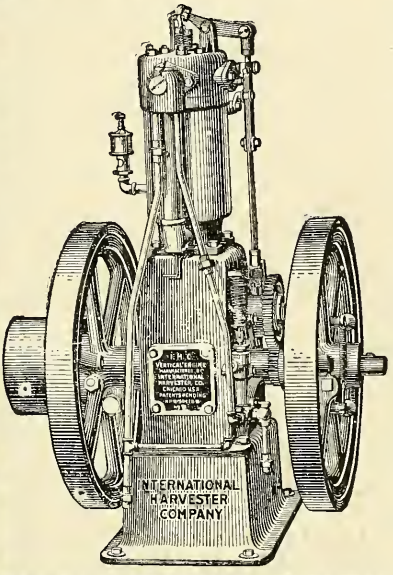

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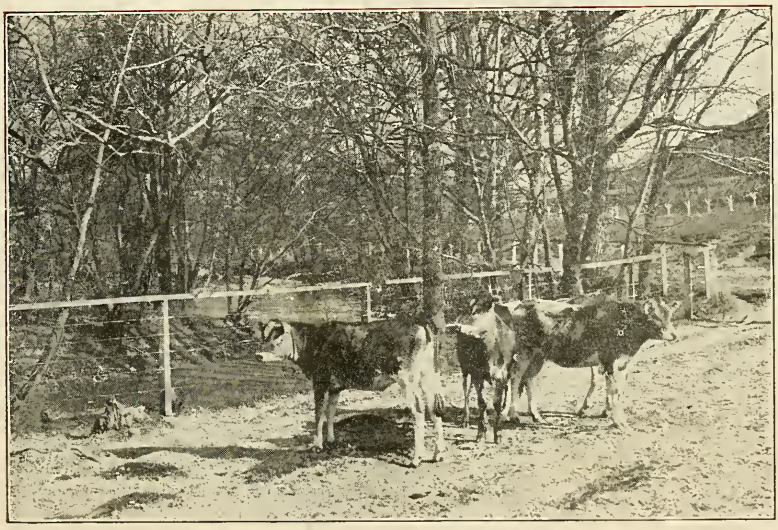

Spring on Third Creek

Vol. III No. 7

APRIL, 1909

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Each article is **authoritative**
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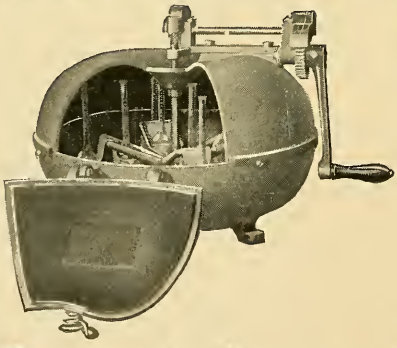

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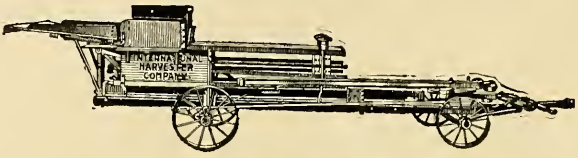

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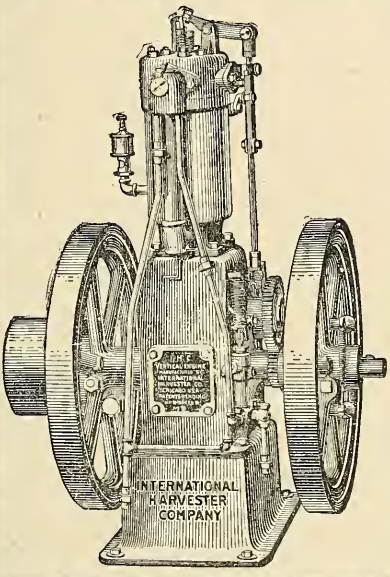

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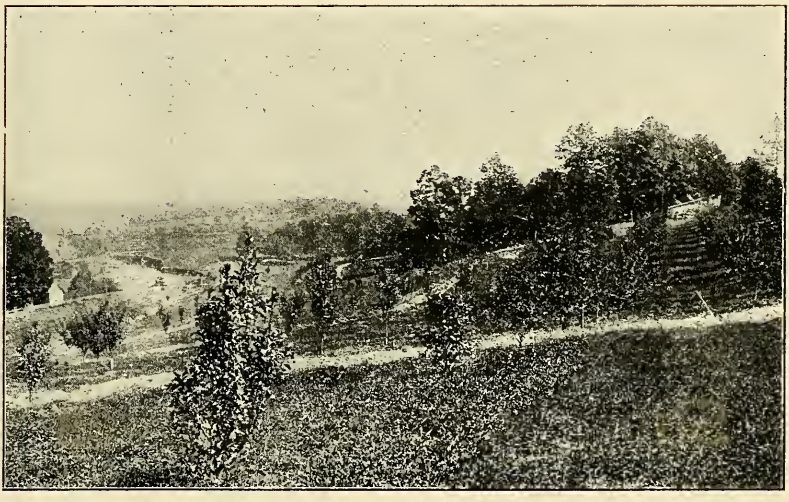

A Hillside on the Fruit Farm

Vol. III No. 8

MAY, 1909

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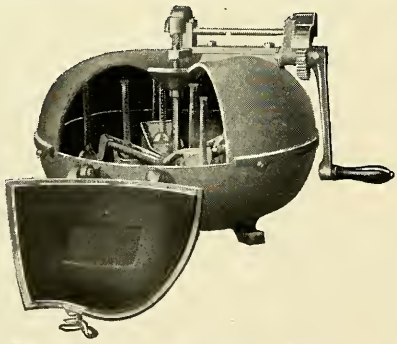

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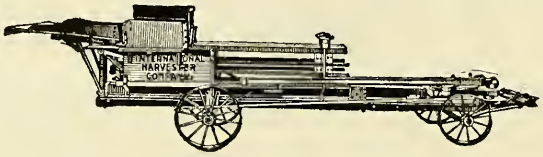

The I. H. C. Pull Power Baling Press is built to bale the greatest amount of materials with the least expenditure of energy. It is easy on both man and horse, and will bale more hay with less power than any other press of its size. This is due to the unique construction of the plunger and power. They furnish speed and great compression power just when they are needed without adding extra draft.

To be brief, the **I. H. C. Pull Power Baling Press** fills the requirements of farmers who want a press that has durability, great capacity and ease of operation to recommend it.

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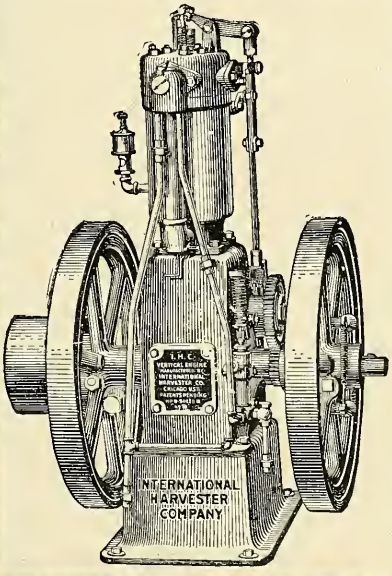

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Vol. III No. 7

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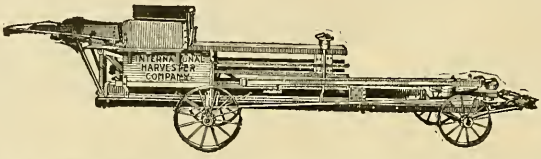

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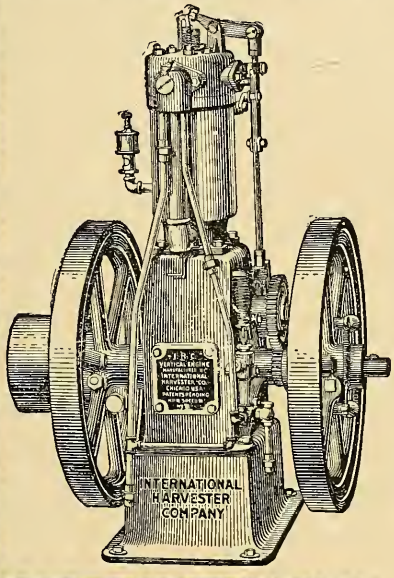

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